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Ethical Oversight of Predictive Analytics in Higher Education

A Case Study

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Keywords

Predictive analytics, machine learning, student success, ethical AI, higher education

Abstract

The use of machine learning (ML) or artificial intelligence (AI) algorithms to make decisions about persons has brought new opportunities and new challenges. While these tools can increase efficiency or lead to new insights, algorithms deployed in human systems do not necessarily reflect the full complexity, nuances, and ethical frameworks of those systems. In many cases, the underlying training data may be limited, or including sensitive information, eliciting privacy concerns. Furthermore, deployment of these models and conveying the results to the stakeholders involved presents challenges and requires appropriate transparency. In recent years, the use of AI/ML-based predictive analytics in higher education has boomed. Institutions using these systems should establish appropriate oversight for their use and deployment. Effective oversight includes not only dissemination of model performance and accuracy, but also how to implement the tool and communicate to stakeholders about results. Oversight of this type of work should not be left to developers or a few technical people, but should be a concerted effort across a diverse committee with a range of expertise and perspectives. In this paper we present a case study as a model for effective ethical oversight that addresses many of these concerns.

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1. Introduction

Over the past few decades, advancements in computing speed and data storage capabilities have resulted in the ability to create, store, and analyse vast quantities of data. Analytical tools and algorithms, such as those used in machine-learning (ML) and artificial intelligence (AI) systems are now applied across many areas of modern society, consuming both structured and unstructured data for the purpose of forecasting, prediction, and decision support, including to make decisions for and about people.

Sociotechnical systems, where social, economic, and/or cultural considerations are important, require additional assessment throughout the development and deployment process, moving beyond model accuracy and predictive power to also consider questions of privacy, fairness, and respect for persons. Decisions made by these algorithms can have profound economic and social consequences at both the individual and population levels. (O’Neil 2017; Olteanu et al. 2019; Selbst et al. 2019; Rubel/Casto/Pham 2020; Birhane 2021; Schwartz et al. 2022; Broussard 2023; Abassi 2025). The greater the potential risk or adverse effects to persons or society, the higher the standard of care is necessary to ensure safety (Martens 2022). It is not enough to be assured of accuracy: when decisions are made about people, there must be both a justification for the tool use, and a level of transparency about the project that is in proportion to the implications of the decision (Olhede/Wolfe 2018; Rubel 2020).

One sector that has experienced a recent and rapid increase in the number of AI/ML algorithms deployed is higher education. Enterprise data systems, such as student information systems (SIS), learning management systems (LMS), and customer relationship management (CRM) tools, which are a necessary component for managing university business operations, generate vast quantities of data and metadata resulting in what has been termed the “datafication” of higher education (D Florea/S Florea 2020; Komljenovic/Sellar/Birch 2025). Institutions may analyse data at hand to determine how best to improve student outcomes, evaluate program efficacy, or leverage institutional resources, with examples in the realms of recruitment and admissions, financial aid awarding, student success/evaluation, and

alumni giving (Ekowo/Palmer 2016; Lawson et al. 2016; May/Iksal/Usener 2016; Bird et al. 2022; Burd 2024; Weinberg 2024). Using institutional data from an SIS or CRM, these tools can be used to make decisions or predictions at the level of an individual student. In other words, institutions are increasingly making use of large swaths of data about and from students to not only assist with evaluation and policy setting, but also to make student-level predictions on a variety of settings, including the likelihood of enrolling or being retained at the institution. The use of this type of data for analytics and assessment has opened new questions about ethics, particularly with respect to whether these types of tools balance beneficence (i.e. working towards students' benefit) with any potential harms or the loss of student agency, autonomy, and privacy (May/Iksal/Usener 2016; Corrin 2021; O'Donoghue 2023).

One complexity in sociotechnical systems (not unique to higher education) is that the majority of the AI/ML tools in use are privately developed. These products are sold to institutions by companies and consulting firms promising efficiency and accuracy of their ML/AI tools, yet these same companies typically provide limited information on the algorithm used, with models and decision making considering a proprietary process. This lack of transparency often renders these tools a “black box” for an adopting institution (Mittelstadt et al. 2016; Ekowo/Palmer 2017; Burd 2024; Weinberg 2024). Compounding the issue, developers at private companies may lack sufficient domain or institution-specific knowledge to understand the nature of the underlying data; indeed, many university administrators implementing these tools may be sufficiently removed from the data generation process to understand data limitations or constraints (Mathies 2018). The tools are often sold as a “one size fits all” solution that does not take into account the local data structure or social framework (“the portability trap”) (Olteanu et al. 2019; Selbst et al. 2019;). Human oversight of these types of algorithms is often insufficient and can inadvertently increase the risk of bias and misuse (D Florea/S Florea 2020; Green 2022).

Even when models and algorithms are developed in-house, few institutions have policies or procedures governing oversight of these tools, or even policies that clearly state how and when student data may be used in

assessment (Komljenovic/Sellar/Birch 2025). A recent review of data privacy policies at 151 private and public universities in the United States found most privacy policies are unequipped for the types of data generated at a modern post-secondary institution (Brown/Klein 2020). Among their key findings: while privacy policies may outwardly grant students authority over their data, student agency is quite limited given the many sources and types of data. Additionally, privacy policies treat data as static and restricted to traditional educational records (e.g. grades, transcripts), rather than broadening policies to include data created by IP addresses, card swipes, and/or metadata within an LMS. When data are consumed or analysed by third party vendors, the data use agreement is a service level agreement between the vendor and the institution, with inconsistent protections given to students (Reidenberg et al. 2013; Reidenberg/Schaub 2018). Lastly, privacy policies do not often articulate the “why” for a particular project or define a particular project's rationale, risks, and benefits (Brown/Klein 2020).

When implemented, institutions do not often give sufficient forethought to effective deployment of the tool, which can make all the difference in the success of a project. Those responsible for administering the tool may lack sufficient training, or the project may lack clear rubrics for how to interpret the results and communicate to students or other stakeholders. Models may be deployed in an inappropriate setting, generate errors, raise privacy concerns, and/or poorly understood. This oversight can result in an outcome that is the opposite of what was intended. During the deployment of a student early warning indicator in Australia, while the bulk of communications sent because of the model output were found to increase student retention, some academic staff sent email communications to students threatening them with failure; these messages were found to be very demotivating for students (Lawson et al. 2016). This example demonstrates that an AI/ML product implemented without clear institutional oversight and user training can lead to tools that increase harm, rather than mitigate it.

In this paper, we outline our institution's deployment and oversight of a ML algorithm developed in-house to assist in student success and retention. This type of model has been used extensively in higher education (Lawson et al. 2016; Bird et al. 2022; Cardona et al. 2023). We used the term “student

support model” for our algorithm. While “student risk model” is often seen in the literature, the word “risk” implies a deficit-framing perspective, and the goal of the algorithm is to increase student success rates (i.e. earning degrees). The purpose of the model used at our institution was to serve as an early warning indicator, notifying advisors or other stakeholders as soon as possible in the first semester of enrolment that a student is at risk of not being retained in the first year.

The paper is organized as follows. First, we describe the general motivation and framework for ethical oversight that shaped our institution’s decision making around model deployment and evaluation. This section includes a brief review of the literature on ethical deployment of sociotechnical systems, as well as the current state of the regulatory landscape. In section three, we give an overview of the model, including design decisions informed by concerns regarding algorithmic fairness. We also describe the process to establish ethical oversight and evaluation of the tool. In section four, we describe the results of our initial assessment. The paper concludes with a discussion of how we are using the process in an iterative manner to continue to improve both the oversight and usability of the tool, as well as some project limitations. It is hoped that the case study presented in this paper could serve as a model to other institutes of higher education who seek to deploy ML/AI algorithms while maintaining ethical oversight and respect for persons.

2. Framework for Ethical Oversight

In classical Aristotelian ethics, the goal of the moral person is to optimize between two extremes: deficiency and excess. When this objective is applied to algorithms, deficiency results from ignoring all available data and applying no model at all, whereas excess would be the use of all available data, without regard to privacy, fairness, or potential misuse or misapplication (Martens 2020). In the context of student success, looking at univariate or bivariate relationships is often insufficient for examining risk factors leading to poor grades or non-retention at the institution. ML/AI has the potential to find patterns and make predictions at scale and with high accuracy. Thus, the moral position would be to seek to optimize between these extremes and

deploy an algorithm that carefully considers the available data and any data limitations, balances accuracy and fairness in its predictions, is subject to sufficient human oversight, and is employed in a manner that maintains respect to persons (Olteanu et al 2019, Rubel/Castro/Pham 2020).

Unfortunately, little guidance exists for institutions to reference; legislation and policy in the United States lags some of its peer nations in this arena. Existing regulations, such as the Family Educational Rights and Privacy Act (FERPA), are inadequate for fully addressing issues raised by the analytical tools currently available (Brown/Klein 2020; O'Donoghue 2023). Due to both historical constructs and case law precedence, the United States does not grant the same level of rights to persons in the arena of data privacy as the European Union (EU) (Jones 2017). While some states, such as California, are beginning to create laws around data privacy or AI decision making, organizations and agencies have little legal guidance to work with when assessing algorithms. A recent United States Government Accountability Report raised this issue to the House Subcommittee on Research and Technology, Committee on Science, Space, and Technology, specifically calling out higher education as one of the areas in which these algorithms could use additional oversight (GAO 2022). Currently, a gap exists between the capabilities of ML/AI and the ability of policy makers and education professionals to use, assess and implement these tools.

Despite lacking clear legal frameworks (or even informal guidelines) within the U.S., other countries have developed more robust policies or recommendations to guide the development and deployment of algorithms used in sociotechnical contexts. One such formal structure, developed in the United Kingdom (U.K.) is the Data Ethics Framework (Drew 2018; CDDO 2020). While not legally binding in the same way as the EU's General Data Protection Regulation (GDPR) (GDPR 2016), this rubric offers a clear path to assessing the ethical rigor of a sociotechnical tool. Other researchers have created rubrics to define each of the steps along the pathway to develop and deploy ML/AI tools in sociotechnical systems. Martens (2022) recommends a process dubbed the "FAT" method: Fair, Accountable, and Transparent. In this process, the five key steps are 1) data gathering, 2) data pre-processing, 3) modelling, 4) evaluation, and 5) deployment. Fairness is primarily

assessed during the first three stages, while transparency is assessed during the last three stages. Accountability should be in place throughout the process. An alternate design was described by Drew (2018) in her review of the U.K. Data Ethics Framework. This approach uses a service design approach with five steps and differs from the FAT method in that the first step is to bring awareness to the problem to be solved and communicate how ML/AI may be useful in the specific context. The initial step also includes a clear articulation of the benefit to public good and could be described as “defining the problem statement.” Ideally, the work would not be performed by one or two individuals, but a team featuring individuals with different perspectives.

Frameworks such as these are useful for outlining the steps in project design. In practice, stages often blur into one another, and a good system will have feedback and evaluation at all stages. Indeed, the rapidly evolving nature of development in AI/ML and other technological advances demands a dynamic and agile response (Abassi 2025). In this paper, we reconcile these minor differences among the frameworks as follows: 1) define the problem statement and the rationale for using AI/ML within the specific context of higher education, 2) gather and assess the available data, including examining potential limitations of the data or privacy concerns, 3) develop the objective function and model, 4) evaluate the model for accuracy and fairness, and 5) deploy the model with appropriate communication and monitoring systems in place (Figure 1).

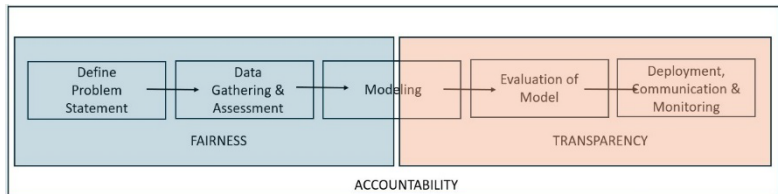


Figure 1: The Ethical Data Science Process. Adapted from (Drew, 2018; Martens, 2022)

Using this approach, the first step is to define the problem and the need for an AI/ML algorithm. In their papers, Drew (2018) and Green (2022) recommend involving the public to make an ethical determination of the need

for the project. In practice “the public” may be a much narrower group of stakeholders; stakeholders within a student success context will include senior administrators, faculty, advisors, financial aid administrators, student affairs staff, technical staff, and students (Abassi 2025). Clearly defining the problem and the use case for AI/ML will help to achieve trust and buy-in at all stages. Early involvement of end users will also ensure that the results can be easily obtained and applied.

The next step in the process is data gathering and assessment. Models used in sociotechnical systems must pay careful consideration to the training data used and determine any data sensitivities or privacy concerns. In their book Martens (2022) describes three types of data that could be used in algorithmic decision making that warrant special attention: personal data, sensitive data, and behavioural data. Personal data is information that can be directly or indirectly linked to a specific individual, such as an identification number, name, or birthdate (Mittelstadt et al. 2016; Martens 2022). Sensitive data includes information which may not be unique to an individual but could have significant privacy implications if disclosed in a way that is tied to an individual, such as financial information, health or biometric data, geographic information, or demographics. This type of data may also include item types protected by laws, such as FERPA or HIPPA. Lastly, behavioural data is information tied to behaviours of persons (Martens 2020) such as visits to a website or physical visits monitored through GPS or card swipes. Within the context of educational records, all three of these domains may be present, making models used in these settings particularly sensitive. Determining what data could and should be used in a particular project and how privacy of individuals is maintained is a key feature of an ethical design process.

Another issue that must be considered at this stage of the project is what, if any, data limitations may exist. Data limitations or concerns can be grouped into three main categories (1) statistical, which includes directional errors (bias), non-representative data, label issues, and model fairness, (2) systemic constraints (sometimes referred to as structural or historical constraints), and (3) human error, including decisions in both model development and deployment (Mittelstadt et al. 2016; Mehrabi et al. 2021; Fountain 2022; Schwartz et al. 2022; van Giffen/Herhausen/Fahse 2022).

Statistical bias can be defined as the difference between the expected and true values of the function and is often directional (Bain/Engelhardt 1992). Importantly, statistical bias can occur for the entire population, or it may only occur on a subset of the observations. In other words, the estimator may function well for the population as a whole, but function poorly (and be directionally biased) for a subset of the observations.

Systemic or structural constraints may be a factor in data limitations. Observations may be clustered, whether geographically or environmentally. Our institution includes six campuses, and degree programs and resources vary across campuses. Students attending the same campus would have experienced a similar learning environment that may be different from that of other campuses. When this type of structure exists within the data, different statistical techniques may be required to handle the non-independence of observations.

Human error is simply a way of stating that people make decisions at every stage of model development, and those decisions with diverse viewpoints have impacts. In their paper, Green (2022) demonstrates that individuals are often poor judges of algorithm quality and/or when human decisions should supersede those made by the algorithm. Ethical project oversight ideally involves multiple people thinking through key decision points, such as the objective function to be modelled, the algorithm used, and the accuracy and fairness assessments employed.

The next stages of the process are modelling and evaluation of the model. While described as two different stages in the framework, the model development and assessment should be iterative, and should not be thought of as a “one and done process,” but rather should be assessed repeatedly over time as new training data and new observations occur. Key decisions at these stages of the project include determining what objective function should be modelled and determining the population(s) upon which the model will work optimally. In an ethically designed sociotechnical system, it is important for humans not to cede agency to the tool and instead establish processes for feedback and refinement if errors are found (Mittelstadt et al. 2016; Schonberger 2019; Rubel/Castro/Pham 2020; Birhane 2021).

Finally, even if a model has been extensively evaluated and tested for accuracy and fairness, there must be communication and monitoring during deployment. Complex tools require many decision points which may neither be inherently ‘good’ or ‘bad’ but could have unforeseen downstream impacts. Often overlooked, but of particular importance in implementing ML/AI in sociotechnical systems is deployment bias (Selbst et al. 2019; Green 2022). Deployment bias, as defined by van Giffen/Herhausen/Fahse (2022), can occur when the model is applied in a different context than that for which it was developed, or (importantly) the results are interpreted incorrectly or inappropriately by humans in a manner not supported or justified by the data and algorithm used. Mitigating this source of bias requires both continual monitoring and proper training for the humans involved in the deployment and use of the model. Best practice requires all stakeholders, from senior administrators to students, are able to view the recommendation made by the tool, have a reasonable understanding of how those recommendations were determined, and be able to identify and correct any errors (Reidenberg/Schaub 2018; O’Donoghue 2023). Taken in sum, if not identified and mitigated, decisions made at many stages of model development and deployment can create impact model utility, fairness, and overall accuracy, even as the tool is perceived as more objective than decisions made by humans alone (Ekowa/Palmer 2016; Benjamin 2019).

3. Methodological Approach

Model Development

This work took place at a multi-campus, public R1 doctoral granting institution (Carnegie Classification: doctoral institution, very high research activity). In the 2021-2022 academic year, the Office of Institutional Research, under the direction of the Provost's Office and the Academic Success and Career Center, developed and implemented a student support model to support retention goals for undergraduates across six campuses. Throughout the process, our team used the framework described in Figure 1 and implemented a service design approach (Kimbell 2011; Drew 2018). In

this framework, the design and deployment of a tool is relational and collaborative. At our institution, that meant receiving feedback from stakeholders (primarily but not limited to the advising community) in order to ensure that the output and results were clear, actionable, and easy to access.

Prior work in the area of predictive modelling and student success at the institution had revealed several issues related to data limitations and student subpopulations. First, the six campuses differ significantly with respect to their student populations, degree programs, student support services, and the amount and type of data available. The majority of students enrolling on the main campus begin as first-time first year students (FTFY) directly following high school graduation. The main campus is residential, and FTFY students have an on-campus living requirement in their first year. This campus offers a full suite of student organizations and activities, including athletics, a robust Greek system, and recreational facilities. Two of the other campuses are smaller, do not have on campus residential housing, and have an equal mix of traditional FTFY students and transfer students (students with prior post-secondary coursework following high school graduation). One campus is entirely online, with a high percentage of non-traditional students, and two of the campuses enroll only transfer students and have a more limited suite of degree program offerings. While Greek affiliation and other types of student involvement have been shown to promote student engagement and retention (DeBard/Sacks 2011; Biddix/Singer/Aslinger 2018), as noted above the availability of programming (and thus data demonstrating student involvement and connectivity) differs substantially among campuses. Furthermore, even within a campus, different student populations (e.g. traditional FTFY students vs transfer students, residential students vs commuter students) have very different academic trajectories at the institution and different factors impacting their success.

Due to these structural constraints, one key early design decision was to create separate models for each of the campuses. The main residential campus hosts the majority of the undergraduate student population and prior work had shown that any single model predicting student success across the entire population of students was likely to be skewed heavily towards factors

impacting student success on the main campus. In other words, high model accuracy would mainly be achieved by high accuracy at only one campus.

Another issue discovered in an earlier tool used at the institution was that if all students were included in a single model without taking into account their year of study or admission type (e.g. FTFY vs transfer), the model would predict that students nearing the end of their academic career were more likely to graduate than students in the first year. This result proved unworkable for advisors, as nearly all their new entering FTFY students were flagged to be at-risk of dropping out. This finding illustrates a survivorship issue within the data: students who have been enrolled and successfully certified in their major represent students who have already demonstrated the ability to succeed academically at the institution. Again, in considering an ethical framework for model development and use, a decision was made to place students into cohorts and fit models by cohort and admissions classifications. Thus, student populations were once again split. At each campus, two models would be deployed annually, one for FTFY and a second model for transfer students. While it may seem excessive to run models separately by campus and admission status, our initial work found that student status (e.g. FTFY, transfer, campus of enrolment) impacted retention, and (importantly) data availability, so much so that it was important to model each subpopulation independently.

We carefully considered variables inclusion in the model. Preliminary statistical models examining the outcomes of first-year retention and graduation helped to establish a framework for inclusion. Those initial models were logistic regression and included a suite of variables related to student demographics, geographic location, academic performance (high school GPA and standardized test scores), first-generation status, and financial information (unmet financial need). From those early studies, we learned that high school GPA, first-generation status, and unmet financial need were significant predictors of first-year retention. Low high school GPA, being a first-generation college student, and unmet financial need of more than \$7,000 were found to be significant predictors of failure to be retained after the first year.

Building on that earlier work, the initial ML model used a rolling time window of five years of training data of entering students and gradient boosted classifier using decision trees. The Day Zero model, which was the model used at the start of the semester, included basic information obtained from the students' application, such as demographic variables, high school GPA, and geographic information, as well as financial aid information (unmet financial need). In addition, socio-demographic data from U.S. Census Bureau, such as poverty, income, demographic information, and education level, were included by mapping to the ZIP code of the student's last school attended (either high school or prior post-secondary institution). As the semester progressed, information from the SIS (PeopleSoft Campus Solutions) was brought in as it became available, including data on course registrations, course add and drops, holds or other service indicators, program of study, midterm and final grades, and class schedule information. As some variables were added, others were dropped as they became less relevant as predictors. With the exception of the Census Bureau data used in the Day Zero model, all information (including information from the application or financial aid) was obtained from the SIS (hereafter referred to as “administrative data”).

The model consumed data nightly from the SIS, updated predictions, and exported the scores and other basic academic information on a dashboard that was visible to advisors with the advising area of the SIS. This dashboard was filterable, so that advisors might be easily able to find their own students. When viewing a particular student's data, a radio dial showed the current support score (where a high score indicated a concern the student may be in need of additional supports/was at risk of non-retention). The dashboard also contained relevant information about the student's current class registrations and grades, as well as a list of the factors that were determined to be contributing to the particular student's score. The development team met with the advising community to present the dashboard and discuss best practices for reading and interpreting the results.

Project Oversight

In order to establish oversight for this model and to develop a pilot program more broadly that could be used for other ML/AI tools at the institution, the Office of Institutional Research partnered with the Provost's Office to create a committee charged with assessment and ethical oversight of the model. The committee was first established at the start of the 2022-2023 academic year. The committee was co-chaired by a Vice Provost and the Assistant Director of Institutional Research (the authors of this paper). Initial invitees included representatives from the academic advising community, undergraduate admissions, ITS, the Provost's Office, Student Affairs, Institutional Research, and campus and college representation (originally 13 members, including the two co-chairs). All the members were selected for their expertise in the fields of academic advising, student support services, equity and diversity, instruction, and admissions. Some of the committee members had experience with earlier student success models implemented by the institution. The charge for the committee came from the Provost's Office and included authority to "review the model, help guide its maturation, and oversee the introduction and use of the student success model throughout the system." The meeting cadence was every three to four weeks, and the co-chairs met prior to the committee meeting to establish the agenda. A Microsoft Teams site was established for the committee to share documents and communicate, and administrative support was provided by the Provost's Office to assist with managing the Teams site, posting the agenda, meeting minutes, and scheduling.

The first meeting took place in October 2022 and included introductions and a broad overview of the history of predictive analytics in the student success framework at the institution. The committee also discussed some of the opportunities and challenges inherent in using these types of models within higher education. Prior to the meeting, articles had been sent to the committee to help frame the conversation. These papers included Green (2022) and Bauman (2022). As the meetings progressed, the discussion turned towards the nature and types of data included in the model. The committee generally felt that the administrative data currently included had 1) high specificity and relevance to the task, and 2) was low risk for unintended consequences. At a

subsequent meeting, the committee was assigned Bird et al. (2022) as reading material. That paper led the committee to express significant interest in using data from the LMS at our institution (Canvas). LMS data has some drawbacks, as detailed information on timely assignment submission and grades requires faculty to set up their LMS section in consistent manners, which is challenging at such a large and diverse institution. However, the Bird et al. (2022) paper recommended a more basic approach, using log-on and time spent within the system that is summed across courses, which is more feasible. We also discussed the potential of using certain student affairs data, such as card swipe information for the Student Recreation Center to gauge campus engagement, or card swipe data at academic support centres, such as the Math Tutoring Center. Some types of available data, such as card swipes into university housing, were deemed to have significant privacy implications and were removed from use consideration.

Overall, committee support was strong for finding additional sources of data for inclusion in the model. Part of this motivation was to increase the accuracy of the model in the first few weeks of the fall term. One of the limitations of the initial model was that its predictive capability in the first few weeks was low and then increased and remained high immediately following the release of midterm grades. However, by the time midterm grades are provided mid-semester, many students may already be in significant academic distress. Thus, having earlier information, such as engagement within the LMS system, or proxy variables, such as campus or academic support engagement data, could help serve as early warning indicators prior to when the first grades are posted.

Formal Project Assessment

The committee was critical for identifying potential sources of data in their respective areas, such as student organizations or academic support, as well as how data across the system could be better aligned or improved for future use in the model. The committee was also instrumental in setting privacy guardrails and determining what data might be a bit too invasive or have too many privacy concerns for our institution's level of comfort (e.g. card swipes at residence halls). However, the focus on data was narrower than the original

charge for the committee intended. Tto more broadly examine not only specific data elements, but also the implementation and use of the model as a whole, the committee co-chairs decided to have the members of the committee formally evaluate the model and implementation using a voting strategy. The rubric for assessment was largely built on the rubric suggested by the Government of the United Kingdom (CDDO 2020). The UK rubric was adapted for a higher education framework (where the “public” is internal to the institution, namely students and employees), and our particular institution's culture.

Rubric	
Theme	Description
Transparency	Information about the project, its methods, and outcomes is publicly available
Accountability	Mechanisms for scrutiny, governance, or peer review for the project have been established
Fairness	The project promotes just and equitable outcomes with negligible detrimental effects

Table 1: Accountability Rubrics for Assessment

Questions were administered during a committee meeting via a Zoom poll. The first set of questions assessed the transparency, accountability, and fairness of the project, (see Table 1). For each of these questions, the model and implementation were evaluated within the context of the institution, thus “public” refers to students and employees of the institution and not the public at large. The second set of questions focused on specific actions involved in the oversight of the model and its used, (Table 2). Each question had a five-point scale: strongly agree (SA), agree (A), neutral (N), disagree (D), and strongly disagree (SD). Ten committee members attended this meeting, though the co-chairs and the model developer abstained from the voting (seven members voting). One of the co-chairs (Kane) took notes on the discussion. Meeting minutes were also regularly posted to the Teams channel. Following the voting, the committee discussed the results and

provided context as to why they voted a particular way and offered suggestions to improve scores on each of the items.

Rubric	
Theme	Description
Public Benefit	Public benefit and/or user needs are clearly defined and understood
Diverse expertise	The project team is diverse and there is sufficient expert input
Comply with the law	There is clarity on legal requirements for the project
Data limitations	Data for the project are of good quality, suitable representativeness, and reliable
Model limitations	The model is reproducible and likely to produce valid outputs.
Wider implications	There are long-term, continuous evaluation and maintenance structures in place

Table 2: Actions to Assess Project

4. Results of Assessment

Results from the poll are show in Table 3. The committee felt more work needed to be done to improve transparency, accountability, and fairness. Of these three metrics, the committee felt we were furthest along on fairness, but the group needed to make improvements in the training materials provided to advisors and communicate more clearly about how to use and interpret the results they will see for a particular student. In addition, the committee emphasized that this tool is only one piece of student success, and that additional services and support structures need to be in place to help students. The committee also recommended more faculty involvement in the process, as they play a pivotal role in the success of students.

With respect to transparency and accountability, the committee recommended that we develop an internal-facing website, both to inform

students of the use of the model, what kinds of data are included, and how the information is used, as well as to raise awareness among employees. Part of the motivation for more employee awareness is to help develop a culture of data governance and record keeping. For example, metrics on student participation in registered student organizations is sometimes inconsistent and haphazard. Improving these sources of information could lead to additional early indicators of students who may be struggling. The committee also recognized that the model deployment was still in the early stages, and that many of the suggestions will take time to implement.

Accountability Results					
Theme	SA	A	N	D	SD
Transparency	0%	0%	29%	57%	14%
Accountability	0%	14%	43%	14%	29%
Fairness	0%	43%	43%	14%	0%

Table 3: Results for Accountability Assessment

As with the accountability assessment, when asked to assess actions associated with implementation, the committee emphasized that we must do more work to clarify our goals and evaluate our project, (Table 4). To better define the public benefit, we need to improve documentation and awareness (again, with the development of an internal website as mentioned above), and to improve other student services. The committee also recommended more frequent feedback from within the advising community, as well as a continuous monitoring process that is well articulated.

One specific recommendation was to add someone with legal expertise. The institution had recently hired a privacy officer, and this individual was later invited to join the committee. We also considered adding an attorney, especially given that the state in which the institution was located was considering AI transparency and privacy legislation. While the legislation had not passed, one benefit from this committee’s work was that it was designed to meet the requirements of the proposed bill, which included a clause on public disclosure and transparency.

Action Results					
Theme	SA	A	N	D	SD
Public Benefit	14%	29%	14%	29%	14%
Diverse expertise	57%	14%	29%	0%	0%
Comply with the law	0%	17%	67%	17%	0%
Data limitations	0%	43%	57%	0%	0%
Model limitations	0%	71%	29%	0%	0%
Wider implications	0%	14%	57%	29%	0%

Table 4: Results for Action Assessment

5. Discussion

Since our original model and committee oversight was put into place, the use of AI in higher education has continued to explode. The proliferation of these tools outpaces not only institutions' ability to understand and evaluate the tools, but also the state and Federal governments' ability to regulate or create policies to protect privacy and ensure fairness in a legal framework, much less within a larger social framework. Some authors have argued that that before any technology is implemented, questions should be asked about whether a non-technical solution would be better and that stakeholders and the public should push back against technological solutions in higher education (O'Neil 2017; Bird et al. 2022). Others have taken a more nuanced perspective, agreeing that a clear problem statement and justification should be articulated, with appropriate oversight and boundaries for an ethical use of the tool (May/Iksal/Usener 2016; Mathies 2018; D Florea/S Florea 2020; Martens 2022; Broussard 2023; O'Donoghue 2023; Abassi 2025). Our institution has implemented policies and practices that align more closely with the latter perspective. Scalable, effective tools often require the compilation and distillation of large amounts of data. Failing to use these data in support of student retention and graduation outcomes often results in solutions that are ad hoc, anecdotal, and simply not scalable given the number of students involved and the typical size of advising student load. However, we agree

that issues of privacy and model oversight are of paramount importance. Ethical use of these models in educational settings requires transparency, explanations of limitations, and clear acceptable use guidelines.

The work of refining and implementing the student support model at our institution is just beginning, as is the work of this ethics oversight committee. One frustration of advisors with the initial model was that, despite high prediction accuracy, it was difficult to understand why a student might be flagged as being at risk for dropping out. While factors influencing the prediction score were shown to advisors, many of these had limited ability to be acted upon (for example, characteristics of the high school). The model has been significantly reworked, and the new version is currently in beta testing. Rather than predict retention in the first year, the revised model changed the objective function and now predicts whether or not a student is at risk for failing a class in the first term. This outcome has advantages in that it is proximal (near-term), it is well suited for prediction given the heavy reliance on administrative data, and factors impacting course grades are often (not always) more actionable from a faculty or advisor standpoint.

Another key revision is the inclusion of a new variable, one that assesses the rigor of the student's coursework for that term and compares it the student's prior academic history. For example, a student with a relatively low entering GPA and a relatively difficult first semester course work (based on historical student performance in a similar set of courses) will be a flag for an advisor that the student may need additional tutoring or wrap-around services. These changes were made with the goal of having more actionable insights from the tool. We recognize that students may withdraw for many reasons, not all of which are academic. The revised algorithm seeks to identify risk factors for failing a class, which is strongly associated for withdrawal due to academic reasons.

In responding to the recommendations for the committee, we are also in the process of examining the LMS data and understanding patterns of log-ins across programs and campuses, to determine the best way to incorporate it into the model. At the current time, the LMS system is used within 97% of undergraduate course sections; this high level of penetration is promising. We

expect that inclusion of these data will help find patterns where students' level of engagement changes or are less engaged than peers enrolled in similar coursework. By focusing heavily on academic and administrative data tied to course performance, advisors will have a better idea of what type of outreach is warranted when a student is flagged as being at risk.

One recommendation that we have yet to implement but has received the most discussion is the inclusion of the student voice (Corrin 2021; O'Donoghue 2023). Many authors have made the case that student awareness of how their data is used and granting students the opportunity to dialogue with faculty and staff regarding information or decisions that may be obtained from ML/AI tools would go a long way to addressing issues of agency, informed consent, privacy concerns, and respect for persons (May/Iksal/Usener 2016; D Florea/S Florea 2020, Corrin 2021; O'Donoghue 2023). The committee strongly recommended for a website and public disclosure, which may eventually be legally required should the state pass legislation to that effect. Additionally, there was strong support for either adding a student to the ethics committee or having focus groups or work groups of students to provide feedback on the model's use.

More debate existed within the committee and advising community around whether to make the score from the model visible to students, either as part of their advising visits or as something they can access on their own. On one hand, the ability to view that information might lead to a helpful discussion with the advisor about course load difficulty or deployment of student support structures such as tutoring or accommodations. On the other hand, we want to make sure that students do not assume blame or self-doubt, creating demotivation (Lawson et al. 2016). Balancing those two considerations is tricky. It is likely in the coming months as the new model is deployed, we may conduct a pilot test where some students are provided more awareness of how their information is being used in support of retention and graduation efforts at the institution.

This work does have limitations. An early warning indicator is only one piece of student success. This model, especially in its current version, is most useful for assisting in academic success. For example, the information about a

particular student might be useful for having conversations about overall course load difficulty or whether additional academic supports might be useful. While grades and course engagement can be a proxy for other issues, such as mental or physical health concerns, the model would not be able to distinguish among those possibilities. Clear training with advisors about how to use—and not use—the model’s results are important. We recognize that language matters, and how we describe this algorithm and its use case is important. The burden of retention does not fall solely on the shoulders of students; faculty and staff also have a role to meet students where they are and help provide the tools they need to be successful.

Secondly, knowing that students are at risk of failing a class is insufficient on its own if institutions do not also establish protocols for responding and assisting students with whatever support they may need, whether it is academic, financial, health related, or something else. Our institution currently lacks a clear way to effectively triage students beyond the faculty/advisor level. Furthermore, this academic warning system needs to be tied more closely to other support systems, such as that used by Student Affairs for students struggling with non-academic issues, such as mental health or food insecurity. More work needs to be done in this space, and we need to not only be able to quickly identify students who may benefit from additional services, but also activate and deploy those resources. Use of these models should not exist in a vacuum, and it is important that institutions build the infrastructure to support students throughout their academic career. To that end, another current focus of the institution is to utilize the CRM more effectively to mobilize services. We hope to also have data to feed back into the model, so if a faculty member or advisor reaches out to a student or directs them to services, we can include that information in the model to update predictions and assess efficacy of interventions.

While work is ongoing, the establishment of this oversight committee, and more importantly, the exercise of the formal scoring the project on a series of metrics to assess its use, has triggered thoughtful and respectful conversations. The committee co-chairs were surprised that generally the committee was less worried about the technical aspects (such as accuracy) or the types of data included in the model, and more concerned with

transparency surrounding the model's use, the limitations of the model, and the interpretation and use of the results by humans. In this sense, the committee has a framework similar to Gillespie (2013), who argues that humans have a larger role in “automated” algorithms than they often like to admit. Many of the committee's suggestions came back to increased documentation, training, and resources for deployment. The suggestions are both specific and achievable, and we will work to implement those going forward. We also want to emphasize that this work should be seen as iterative, ongoing, and collaborative, rather than fixed and determinative, as key aspects of cyber-ethical leadership (Abassi 2025).

Applying a scoring rubric to a model developed in house requires some humility, (especially in the early stages of deployment), as developers and promoters may find out they need to make significant improvements to either the model or its implementation. In this paper, we have presented a framework that institutions could adopt to fit their specific use case and institutional characteristics. Ultimately, we hope this process and mechanism for continual oversight and review will be useful for institutions who seek to balance the use of powerful ML/AI tools for student success or institutional efficiency with respect for persons, fairness, and privacy. Tools of this type require continuous monitoring and re-assessment to ensure that they continue to work as intended and that both students and employees understand its value.

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8. Short biography

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L'IA générative dans l'enseignement supérieur tunisien

- Première partie : Les fondements
entre transformation pédagogique et enjeux éthiques

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Mots clés

Intelligence artificielle, IA générative, IAg, adoption technologique, PLS-SEM, intention d'usage, usage réel, éthique, enseignement supérieur tunisien

Résumé

L'intégration de l'IAg dans l'enseignement supérieur transforme les pratiques pédagogiques tout en soulevant des enjeux éthiques. Cette première partie développe le cadre théorique et méthodologique d'un modèle explicatif de l'adoption de l'IAg dans le contexte universitaire tunisien et en valide le modèle de mesure. Le modèle proposé intègre les apports des cadres TAM, UTAUT, UTAUT2 et TOE, enrichis par les dimensions du risque perçu et de l'éthique. Une démarche quantitative hypothético-déductive a été conduite auprès de 242 étudiants tunisiens, dont 221 utilisateurs effectifs de l'IAg. Les données ont été analysées par modélisation par équations structurelles PLS-SEM. Les résultats confirment la fiabilité ainsi que la validité convergente et discriminante des construits, fournissant une base empirique robuste pour l'analyse du modèle structurel. L'analyse des relations hypothétiques et de leurs implications fera l'objet de la seconde partie de cette recherche.

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1. Introduction

L'essor rapide de l'intelligence artificielle générative (IAg), inscrit dans une dynamique plus large de développement de l'intelligence artificielle en éducation, contribue à transformer les pratiques pédagogiques, la conception des cours et les modes d'apprentissage dans l'enseignement supérieur (Dwivedi et al. 2023 ; Zawacki-Richter et al. 2019). Dans ce contexte, les universités cherchent à intégrer des outils susceptibles d'améliorer l'efficacité pédagogique, de renforcer l'engagement des étudiants et de soutenir l'innovation éducative. Des études récentes montrent que l'intégration d'outils d'intelligence artificielle dans les environnements universitaires est associée à une augmentation de l'engagement étudiant (Ezeoguine/Eteng-Uket 2024) et peut favoriser des pratiques pédagogiques plus innovantes lorsque leur usage est ancré dans des dispositifs pédagogiques adaptés (Noroozi 2025), tout en contribuant à des améliorations de l'enseignement et de l'apprentissage lorsqu'elle est structurée de manière appropriée (Schmidt et al. 2025).

Toutefois, malgré ces bénéfices potentiels, l'adoption effective de l'intelligence artificielle générative demeure hétérogène dans l'enseignement supérieur. Cette hétérogénéité s'explique par l'interaction de facteurs individuels, organisationnels et environnementaux (Venkatesh et al. 2003; Tornatzky/Fleischer 1990), ainsi que par des risques perçus susceptibles de freiner l'usage réel de ces technologies, notamment en termes de perte de contrôle sur les apprentissages, de fiabilité des productions, d'enjeux éthiques et de confidentialité des données (Ameen et al. 2021 ; Pramjeeth /Ramgovind 2024). La littérature récente met ainsi en évidence un intérêt croissant pour l'IAg dans les recherches en éducation, tout en soulignant des défis pédagogiques, éthiques et pratiques qui influencent directement les modalités d'appropriation et d'usage de ces technologies (Lee et al. 2025).

Dans ce cadre, les modèles classiques d'adoption technologique, mobilisés de manière isolée, peuvent apparaître limités pour expliquer les comportements d'intention d'usage et d'usage effectif de l'IAg, caractérisée par un niveau élevé d'autonomie, d'automatisation et d'incertitude. Des travaux récents plaident en faveur d'une articulation de cadres théoriques

complémentaires, notamment le *Technology Acceptance Model* (TAM), l’*Unified Theory of Acceptance and Use of Technology* (UTAUT/UTAUT2) et le cadre *Technology-Organization-Environment* (TOE), afin de mieux appréhender la complexité des mécanismes d’adoption dans des environnements numériques avancés (Aboura 2025 ; Khlaif et al. 2024 ; Granić 2025). Cette approche intégrative est particulièrement pertinente dans le champ éducatif, où les compétences numériques des utilisateurs et le soutien organisationnel jouent un rôle central comme déterminants directs de l’appropriation des technologies émergentes (Venkatesh et al. 2003 ; Venkatesh et al. 2012 ; Hatlevik/ Christophersen 2013 ; Dringó Horváth et al. 2025). Au-delà de leurs effets directs sur l’adoption et l’usage des technologies, ces variables peuvent également être envisagées, dans une perspective exploratoire, comme susceptibles d’exercer un rôle de modération.

S’inscrivant dans cette perspective, la présente étude propose un modèle conceptuel intégratif combinant le TAM, l’UTAUT/UTAUT2 et le cadre TOE, enrichi par le modèle des risques perçus, tel que proposé par Featherman et Pavlou (2003), ainsi que par des considérations éthiques. Ce modèle intègre également des variables modératrices clés, en particulier les compétences numériques des étudiants et le soutien organisationnel perçu, afin de mieux appréhender la manière dont ces facteurs influencent les mécanismes sous-jacents à l’intention d’adoption et à l’usage effectif de l’intelligence artificielle générative dans l’enseignement supérieur. Il vise ainsi à analyser de manière systématique les déterminants de l’intention d’adoption et de l’usage effectif de l’intelligence artificielle générative par les étudiants de l’enseignement supérieur, en offrant un cadre explicatif empirique susceptible de contribuer à l’avancement des travaux sur l’adoption des technologies éducatives avancées et d’éclairer les décisions institutionnelles.

Compte tenu de ces considérations, plusieurs objectifs spécifiques ont été retenus :

- Identifier les facteurs cognitifs et perceptuels influençant l’intention d’usage des outils d’IAg.

- Examiner les dimensions organisationnelles, technologiques et environnementales qui conditionnent leur adoption au sein des institutions universitaires.
- Évaluer l'influence des risques perçus, des compétences numériques et des considérations éthiques, notamment la transparence, la responsabilité, l'équité et les pratiques d'usage responsable, sur l'adoption et l'usage effectif de l'IAg.
- Proposer un modèle conceptuel intégratif, articulant les apports théoriques de TAM, UTAUT, UTAUT2, du cadre TOE et du modèle du risque perçu, tout en intégrant la dimension éthique.

Cette réflexion conduit à formuler la question de recherche suivante : *Quels sont les déterminants individuels, organisationnels, technologiques, perceptuels et éthiques qui influencent l'intention d'usage et l'usage effectif de l'intelligence artificielle générative par les étudiants dans l'enseignement supérieur Tunisien ?*

Afin d'apporter une réponse approfondie, plusieurs questions spécifiques seront examinées :

- Comment les facteurs issus de TAM/UTAUT/UTAUT2 influencent-ils l'intention d'usage ?
- Dans quelle mesure les facteurs institutionnels du cadre TOE affectent-ils l'adoption ?
- Quel est l'impact des risques perçus sur l'intention d'usage ?
- Dans quelle mesure les compétences numériques modèrent-elles les effets perçus des risques ?
- Comment les considérations éthiques influencent-elles l'intention d'usage et l'usage effectif de l'IAg ?
- Comment ces différents facteurs convergent-ils pour expliquer l'usage effectif ?

Sur la base de ces considérations théoriques, les hypothèses de recherche sont formulées de manière structurée. Pour y répondre, cette étude adopte une approche hypothético-déductive fondée sur la mobilisation conjointe de

modèles théoriques majeurs, intégrés dans un cadre conceptuel multidimensionnel.

Dans cette perspective, la présente recherche se structure en deux parties complémentaires présentées à travers deux articles, selon une progression logique allant de la construction du cadre conceptuel à l’interprétation des résultats empiriques et à leurs implications. Cette première partie établit les bases théoriques et méthodologiques de la recherche. Elle propose une revue approfondie de la littérature mobilisant les principaux modèles explicatifs de l’adoption technologique, notamment le TAM, l’UTAUT, l’UTAUT2 et le TOE, enrichis par les approches du risque perçu et des enjeux éthiques liés à l’IA générative. Elle présente ensuite la démarche méthodologique retenue ainsi que l’évaluation rigoureuse du modèle de mesure.

Les relations hypothétiques, leur interprétation ainsi que leurs implications théoriques et pratiques sont développées dans la seconde partie consacrée à la discussion des résultats empiriques.

2. Revue de littérature

2.1. Conceptualisation et impacts pédagogique de l’IA générative

L’intelligence artificielle générative (IAg) désigne des systèmes capables de produire, transformer ou adapter des contenus pédagogiques à partir d’instructions utilisateur, dites *prompts*, permettant une interaction homme-machine orientée vers la génération de contenus éducatifs (Abu Safi/Al Qudah 2024 ; Qian 2025). Dans l’enseignement supérieur, ces technologies forment un ensemble d’outils techno-pédagogiques en structuration progressive, couvrant un continuum d’applications allant des agents conversationnels pour la production académique (El Messaoudi et al. 2025 ; Ding et al. 2025 ; Riahi 2024) aux systèmes d’apprentissage adaptatif et de tutorat intelligent orientés vers la personnalisation des parcours (Faouzi et al. 2025 ; Luo et al. 2025 ; Tahir et al. 2024 ; Huang et al. 2021).

Sur le plan fonctionnel, l’intégration de l’IAg engendre des effets pédagogiques globalement positifs. Les travaux empiriques soulignent notamment une amélioration perçue de la clarté, de la structuration et de la

qualité linguistique des productions étudiantes (El Messaoudi et al. 2025), ainsi qu'un gain de temps et une utilité accrue. Ces résultats sont corroborés par des revues de la littérature rapportant, dans plusieurs études recensées, des effets positifs de l'IA sur la performance académique et l'engagement des apprenants (Crompton/Burke 2023). Par ailleurs, une méta-analyse récente portant sur 68 études confirme un effet positif modéré de l'IAg générative sur les apprentissages ($SMD \approx 0,45$), les effets étant particulièrement marqués sur l'engagement comportemental, la motivation et l'autorégulation (Han et al. 2025).

Au-delà de la simple production de contenu, l'IAg favorise l'apprentissage autorégulé et la résolution de problèmes, notamment dans les dispositifs adaptatifs qui ajustent dynamiquement les parcours aux besoins des apprenants (Du Plooy et al. 2024 ; Faouzi et al. 2025). Dans des domaines tels que l'enseignement des sciences, ces technologies peuvent favoriser une meilleure compréhension conceptuelle, à condition qu'elles soient alignées avec les objectifs pédagogiques et les approches didactiques appropriées (Almasri 2024). Ainsi, l'IAg s'affirme comme un levier de transformation majeur, bien que son efficacité demeure conditionnée par les compétences numériques et le sens critique des étudiants face aux enjeux éthiques de ces outils.

2.2. Modèles théoriques d'adoption des technologies

L'analyse de l'adoption de l'IAg dans l'enseignement supérieur mobilise plusieurs cadres théoriques complémentaires issus de la littérature sur l'acceptation des technologies. Elle s'appuie notamment sur les modèles TAM, UTAUT, UTAUT2, le cadre TOE ainsi que le modèle des risques perçus afin d'examiner les principaux facteurs explicatifs de leur adoption dans le contexte de l'IA générative.

Dans cette perspective, le *Technology Acceptance Model* (TAM) constitue un socle théorique fondamental en identifiant l'utilité perçue (PU) et la facilité d'utilisation perçue (PEOU) comme déterminants centraux de l'intention d'usage (Davis 1989). Ces dimensions restent particulièrement pertinentes dans le contexte de l'IAg, où l'adoption dépend étroitement des bénéfices perçus en termes de performance académique, de gain de temps et

d’amélioration de la qualité des productions, ainsi que de la simplicité d’interaction avec les outils (Ouzif et al. 2025 ; Aboura 2025). En outre, la littérature souligne que, malgré la diffusion rapide des technologies d’IAG dans l’éducation, les validations empiriques systématiques de leur valeur pédagogique demeurent encore limitées, ce qui renforce la pertinence du recours à des modèles éprouvés comme le TAM (Zawacki-Richter et al. 2019).

Dans cette logique, l’utilité perçue peut être assimilée à la performance attendue, tandis que la facilité d’utilisation renvoie à l’effort requis, permettant ainsi d’articuler directement TAM avec les modèles plus récents. Sur cette base, il est attendu que l’utilité perçue et la facilité d’utilisation influencent positivement l’intention d’usage (H1, H2).

H1 : l’utilité perçue (PU) influence positivement l’intention d’utiliser l’IA générative

H2 : La facilité d’utilisation perçue ou l’effort attendu (EE) influence positivement l’intention d’usage de l’IAG.

Dans le prolongement de cette approche, la *Unified Theory of Acceptance and Use of Technology* (UTAUT) enrichit l’analyse en intégrant des déterminants sociaux et organisationnels, notamment l’influence sociale (SI) et les conditions facilitatrices (FC) (Venkatesh et al. 2003). Ces facteurs traduisent respectivement le rôle des normes sociales, des pairs et des enseignants, ainsi que la disponibilité des ressources techniques et organisationnelles nécessaires à l’usage effectif des technologies. Dans les contextes universitaires, en particulier dans les régions africaines et MENA, ces dimensions apparaissent déterminantes, les politiques institutionnelles, le soutien organisationnel et les dynamiques sociales structurent fortement l’appropriation des outils numériques (Alalwan et al. 2017 ; Awwad/Al-Majali 2015 ; Jenfi et al. 2024).

Dans cette perspective, l’influence sociale est susceptible de renforcer l’intention d’usage (H3). Conformément aux modèles d’acceptation technologique, cette intention comportementale constitue ensuite le déterminant proximal de l’usage effectif des technologies (Venkatesh et al. 2003 ; Venkatesh et al. 2012), un constat confirmé dans le contexte de l’IAG

où une intention élevée se traduit par un usage plus fréquent et intégré dans les pratiques académiques (Pramjeeth/Ramgovind, 2024). Dès lors, les conditions facilitatrices, en interaction avec l'intention comportementale, contribuent directement à l'usage effectif des technologies (H11, H12), tandis que l'intention joue un rôle médiateur central entre les déterminants sociaux et l'usage réel.

H3 : L'influence sociale (SI) affecte positivement l'intention d'usage de l'Iag.

H11 : Les conditions facilitatrices (FC) influencent positivement l'usage réel de l'Iag.

H12 : L'intention d'utilisation influence positivement l'usage réel de l'Iag.

Par ailleurs, l'extension UTAUT2 permet d'approfondir la compréhension des mécanismes d'usage en introduisant des dimensions expérientielles et comportementales, notamment la motivation hédonique (HM) et l'habitude (HB) (Venkatesh et al. 2012). Ces variables sont particulièrement pertinentes dans le cas de l'Iag, où l'interaction avec les outils peut générer à la fois un intérêt intrinsèque et une utilisation répétée conduisant à des routines d'usage. Des travaux récents montrent que l'adoption d'outils tels que ChatGPT est favorisée non seulement par leur utilité fonctionnelle, mais aussi par leur caractère intuitif et engageant, ce qui facilite leur intégration dans les pratiques académiques quotidiennes (El Messaoudi et al. 2025 ; Didi 2025). Ainsi, la motivation hédonique et l'habitude apparaissent comme des déterminants positifs de l'intention d'usage (H4, H5).

H4 : La motivation hédonique (HM) influence positivement l'intention d'usage de l'Iag.

H5 : L'habitude (HT) influence positivement l'intention d'usage de l'Iag.

En complément de ces approches centrées sur l'individu, le modèle *Technological-Organizational-Environmental* (TOE) introduit une perspective institutionnelle essentielle en considérant les dimensions technologique, organisationnelle et environnementale de l'adoption (Tornatzky/Fleischer 1990). Ce cadre met en évidence le rôle de la maturité technologique, du soutien organisationnel et de la pression environnementale dans la diffusion des innovations. Dans les contextes éducatifs des pays émergents, ces facteurs apparaissent particulièrement critiques, l'adoption de

l’IAg dépendant fortement de la disponibilité des infrastructures, des politiques institutionnelles et des dispositifs de formation (Huang et al. 2021 ; Mollel 2025 ; Pramjeeth/Ramgovind 2024).

En ce sens, la maturité technologique, le soutien organisationnel et la pression environnementale sont susceptibles d’influencer positivement l’intention d’adoption (H8, H9, H10). De plus, la littérature récente souligne que le soutien organisationnel peut jouer un rôle modérateur en renforçant l’effet de la facilité d’utilisation sur l’intention d’usage (H14), en réduisant les barrières perçues et en facilitant l’appropriation des technologies (Khlaif et al. 2024 ; Feng et al. 2025).

H8 : La maturité technologique (TR) influence positivement l’intention d’usage.

H9 : Le soutien organisationnel (OS) influence positivement l’intention d’usage.

H10 : La pression environnementale (ENV) influence positivement l’intention d’usage.

H14 : Le soutien organisationnel (OS) modère la relation entre la facilité perçue d’utilisation ou l’effort attendu (EE) et l’intention d’usage (BI), en influençant la force de cette relation.

Enfin, le modèle des risques perçus complète ce cadre en intégrant les freins psychologiques et cognitifs à l’adoption (Featherman /Pavlou 2003). Dans le contexte de l’IAg, ces risques concernent notamment la fiabilité des contenus générés, les biais algorithmiques, la dépendance cognitive, les perceptions sociales négatives et les enjeux liés à la confidentialité des données (Zawacki-Richter et al. 2019 ; Pramjeeth/Ramgovind 2024 ; Chauhan/Dutta 2025). Ces dimensions peuvent limiter l’intention d’usage, même lorsque les bénéfices fonctionnels sont reconnus, ce qui justifie l’hypothèse d’un effet négatif des risques perçus sur l’intention d’adoption (H6).

H6 : Les risques perçus (PR) influencent négativement l’intention d’usage.

Dans l’ensemble, l’articulation de ces différents modèles permet de proposer un cadre conceptuel robuste, combinant les dimensions individuelles, sociales et institutionnelles de l’adoption technologique. Une telle approche permet de

dépasser les limites des modèles utilisés isolément et offre une lecture plus fine des mécanismes sous-jacents à l'acceptation et à l'usage des technologies émergentes, en particulier dans le contexte de l'IAg.

2.3. Enjeux éthiques et responsabilité dans l'adoption de l'IAg

Dans le prolongement des modèles d'acceptation technologique, les considérations éthiques apparaissent comme une dimension essentielle pour comprendre l'adoption de l'IAg dans l'enseignement supérieur. En effet, au-delà des bénéfices fonctionnels et des déterminants cognitifs, l'usage de ces technologies soulève des enjeux normatifs susceptibles d'influencer significativement les comportements des étudiants.

Plus précisément, les préoccupations éthiques liées au risque de plagiat, à la fraude académique, au manque de transparence algorithmique ou à l'usage non conforme aux règles institutionnelles constituent des facteurs susceptibles de freiner l'adoption de l'IAg. La littérature récente souligne que la prise de conscience de ces enjeux peut réduire l'intention d'usage, en particulier dans des contextes où les cadres réglementaires et les politiques universitaires restent encore ambigus ou insuffisamment formalisés (Chaudhry/Kazim 2021 ; Joudieh et al. 2024 ; Pramjeeth/ Ramgovind, 2024).

Dans cette perspective, les préoccupations éthiques ne se limitent pas à des considérations abstraites, mais influencent directement la confiance accordée aux technologies ainsi que l'engagement des étudiants dans leur utilisation. En générant des incertitudes quant à la légitimité et à l'acceptabilité des pratiques associées à l'IAg, elles peuvent freiner l'appropriation des outils et limiter leur intégration dans les activités académiques.

Dans ce contexte, les enjeux de gouvernance éthique apparaissent centraux. L'intégration responsable de l'IAg requiert la mise en place de cadres institutionnels transparents, combinant supervision humaine, explicabilité algorithmique et dispositifs d'audit, afin de garantir le respect des normes académiques et de renforcer la confiance des utilisateurs (Chaudhry/Kazim 2021 ; Luckin et al. 2022). À cet égard, la Commission Européenne souligne que :



Une intelligence artificielle digne de confiance doit être à la fois conforme au droit, éthique et robuste

(la Commission européenne 2019 : 2).

Ainsi, l’adoption de l’IAg dans l’enseignement supérieur doit s’inscrire dans une logique d’équilibre entre innovation pédagogique et exigences éthiques, condition essentielle à une transformation durable et responsable des pratiques éducatives.

Dès lors, les préoccupations éthiques peuvent être conceptualisées comme un déterminant négatif spécifique de l’intention d’adoption, complémentaire aux risques perçus. Leur prise en compte permet d’enrichir l’analyse en intégrant une dimension normative essentielle dans les environnements éducatifs, où les enjeux d’intégrité académique et de responsabilité sont particulièrement déterminants. Sur cette base, il est théoriquement cohérent de proposer l’hypothèse suivante :

H7 : Les préoccupations éthiques concernant l’usage de l’IAg influencent négativement l’intention des étudiants d’utiliser ces outils.

2.4. Rôle modérateur des compétences numériques

Les compétences numériques et informationnelles constituent un déterminant transversal central dans l’adoption et l’usage efficace de l’IAg dans l’enseignement supérieur. En effet, elles permettent aux étudiants non seulement d’interpréter et d’exploiter les contenus générés, mais également d’en évaluer la pertinence et la fiabilité, contribuant ainsi à réduire l’effort perçu d’utilisation (EE), à atténuer les risques et à favoriser un usage à la fois réfléchi et éthique des outils numériques (Sergeeva et al. 2025 ; Ranieri et al. 2025 ; Abubakari 2025 ; Dwivedi et al. 2023 ; Khlaif et al. 2024 ; Aboura 2025).

Dans ce prolongement, la littératie informationnelle apparaît comme une composante essentielle de ces compétences, dans la mesure où elle renvoie à la capacité des étudiants à rechercher, vérifier et critiquer l’information. Cette aptitude est particulièrement déterminante dans un environnement marqué par la production automatisée de contenus, puisqu’elle permet de détecter les biais algorithmiques, d’identifier les erreurs et d’ajuster les productions aux

exigences académiques (Aboura 2025 ; Khlaif et al. 2024 ; Chaudhry et al. 2022; Zhai et al. 2023). À cet égard, la maîtrise des techniques de formulation des requêtes [*prompting*], le choix approprié des outils d'IAG et la validation critique des résultats générés s'imposent comme des compétences clés. Leur développement suppose, toutefois, la mise en place de dispositifs de formation pratiques ainsi qu'un accompagnement pédagogique structuré (Mollel 2025 ; Achili/Zerrouki 2024).

Par ailleurs, la littérature récente met en évidence que l'intégration de l'IAG dans les environnements d'apprentissage, lorsqu'elle est accompagnée de compétences numériques adéquates, est associée à une amélioration des résultats académiques et de la valeur pédagogique des dispositifs éducatifs (Faouzi et al. 2025 ; Ranieri et al. 2025). En particulier, les systèmes adaptatifs basés sur l'IAG permettent de personnaliser les parcours d'apprentissage en fonction des besoins et des profils des étudiants, optimisant ainsi leurs performances et leur engagement.

Dans une perspective plus analytique, ces compétences ne se limitent pas à un rôle direct, mais peuvent également jouer un rôle modérateur dans le processus d'adoption. En effet, plusieurs travaux montrent qu'un niveau élevé de compétences numériques permet de réduire l'impact négatif des risques perçus sur l'intention d'adoption, en renforçant la capacité des étudiants à comprendre, contrôler et encadrer l'usage des technologies (Aboura 2025 ; Sergeeva et al. 2025 ; Ranieri et al. 2025). Dès lors, le développement de ces compétences apparaît comme un levier stratégique majeur pour maximiser les bénéfices de l'IAG tout en limitant les freins psychologiques, cognitifs et éthiques associés. Sur cette base, il est théoriquement cohérent de proposer l'hypothèse suivante :

H13 : Les compétences numériques modèrent négativement l'effet des risques perçus sur l'intention d'usage.

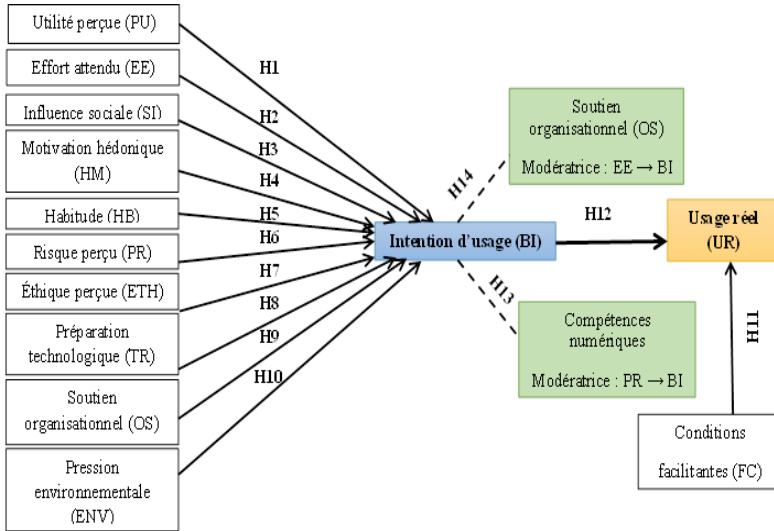
2.5. Intention d’usage et usage effectif

Conformément aux modèles d’acceptation technologique, l’intention comportementale constitue le déterminant principal de l’usage effectif des technologies (Venkatesh et al. 2003 ; Venkatesh et al. 2012). Dans le contexte de l’IAg, les études empiriques confirment que les étudiants ayant une intention d’usage élevée adoptent ces outils de manière plus fréquente et plus intégrée dans leurs pratiques académiques (Pramjeeth/Ramgovind 2024). De ce fait, l’intention agit ainsi comme un mécanisme central de transformation des perceptions en comportement réel. Elle occupe une position médiatrice entre les déterminants cognitifs, sociaux et institutionnels et l’usage effectif des technologies. Sur cette base, il est proposé que l’intention d’usage influence positivement l’utilisation réelle de l’IAg (H12).

Le modèle conceptuel proposé adopte une approche intégrative articulant des déterminants individuels, organisationnels et éthiques afin d’analyser de manière cohérente l’adoption de l’IAg dans l’enseignement supérieur tunisien. Fondé sur la combinaison des cadres TAM, UTAUT/UTAUT2 et TOE, enrichie par les risques perçus et les préoccupations éthiques, il structure quatorze hypothèses (H1–H14) autour de trois dimensions : facteurs individuels, conditions institutionnelles et freins psychosociaux. Dans cette configuration, l’intention comportementale joue un rôle pivot en tant que variable médiatrice reliant les perceptions à l’usage effectif. Le modèle intègre deux modérateurs clés : les compétences numériques et informationnelles, qui sont susceptibles d’atténuer l’effet des risques perçus sur l’intention d’usage, et le soutien organisationnel, qui est susceptible de renforcer l’impact de la facilité d’utilisation perçue sur l’intention d’usage.

Dès lors, ce cadre propose une modélisation robuste combinant effets directs, médiateurs et modérateurs, et constitue une base analytique solide pour le test empirique et l’analyse des dynamiques d’appropriation de l’IAg en contexte universitaire tunisien.

Figure 1: Le modèle conceptuel



Source : Élaboration propre

3. Méthodologie de la recherche

3.1. Le design de l'étude

Cette recherche adopte un design quantitatif fondé sur une approche hypothético-déductive visant à tester empiriquement le modèle conceptuel proposé. Les données ont été collectées au moyen d'un questionnaire structuré administré auprès d'étudiants de l'enseignement supérieur tunisien, puis analysées à l'aide de la modélisation des équations structurelles par la méthode PLS-SEM, particulièrement adaptée à l'évaluation de modèles complexes intégrant des relations directes, médiatrices et modératrices. Ce dispositif méthodologique permet d'examiner simultanément les déterminants de l'intention d'usage et de l'usage effectif de l'intelligence artificielle générative, tout en assurant la robustesse des résultats et la validité du modèle proposé.

3.2. Description de l’échantillon et du protocole de collecte des données

L’échantillon de l’étude comprend 242 étudiants, dont 221 utilisateurs effectifs de l’IAg retenus pour l’analyse PLS-SEM après filtrage préalable. Cette taille d’échantillon dépasse les recommandations de Hair et al. (2022), assurant une puissance statistique satisfaisante ainsi que la robustesse des estimations du modèle. L’étude repose sur un échantillonnage non probabiliste combinant convenance et boule de neige, particulièrement adapté à un contexte exploratoire d’adoption d’une technologie émergente, bien qu’il implique des limites en termes de biais de sélection et de généralisation.

Les critères d’inclusion retenus concernaient exclusivement des étudiants âgés de 18 ans ou plus, inscrits dans un établissement d’enseignement supérieur en Tunisie. Les répondants ont ensuite été distingués entre utilisateurs et non-utilisateurs de l’IAg, les analyses étant centrées sur les utilisateurs effectifs. Le recrutement des participants a été réalisé via des canaux numériques académiques (emails institutionnels, plateformes pédagogiques et réseaux sociaux étudiants), accompagnés d’un message précisant les objectifs de la recherche, les conditions d’éligibilité et le caractère volontaire de la participation.

Un pré-test du questionnaire a été conduit auprès d’un petit échantillon (10 étudiants) afin d’évaluer la clarté des items, la compréhension des construits mobilisés et la durée de passation. Les retours obtenus ont permis d’apporter des ajustements mineurs de formulation, sans altérer la structure conceptuelle du modèle.

Par ailleurs, certains biais potentiels ont été identifiés, notamment un biais d’auto-sélection, les étudiants familiers avec l’IAg étant plus enclins à participer, ainsi qu’un biais de désirabilité sociale susceptible d’influencer les réponses. Ces biais ont été atténués par l’anonymat du questionnaire et la formulation neutre des items, et ont été pris en compte dans l’interprétation des résultats.

Enfin, l’étude respecte les principes éthiques de la recherche. Un consentement éclairé a été présenté en introduction du questionnaire, précisant les objectifs, la durée, le caractère volontaire de la participation, le

droit de retrait et l'usage scientifique des données. Les données ont été collectées de manière anonyme, sans enregistrement d'informations personnelles, stockées de façon sécurisée et utilisées exclusivement à des fins de recherche, avec obtention des autorisations institutionnelles requises.

3.3. Tableaux des variables de mesure et hypothèses associées

Le modèle conceptuel s'appuie sur une structuration en trois niveaux :

- Les variables principales et les hypothèses associées
- Les effets modérateurs permettant de capturer les interactions entre les construits
- Les variables de contrôle visant à neutraliser les effets liés aux caractéristiques individuelles.

Tableau 1: Variables principales du modèle et hypothèses associées

Variable / abréviation	Définition synthétique	Items	Hypothèse associée
Utilité perçue (PU)	Perception que l'IAg améliore la performance académique	4	H1 : PU → BI
Effort attendu (EE)	Perception que l'usage de l'IAg demande peu d'effort	3	H2 : EE → BI
Influence sociale (SI)	Influence perçue des enseignants, pairs et institution	3	H3 : SI → BI
Motivation hédonique (HM)	Plaisir, intérêt et satisfaction procurés	3	H4 : HM → BI
Habitude (HB)	Usage routinier des outils	3	H5 : HB → BI
Risques perçus (PR)	Craintes liées aux erreurs, biais ou plagiat.	6	H6 : PR → BI (–)
Éthique perçue (ETH)	Respect des règles et normes éthiques institutionnelles	4	H7 : ETH → BI (–)
Préparation technologique (TR)	Disponibilité, qualité et adéquation technique des outils	3	H8 : TR → BI

Soutien organisationnel(OS)	Formation, assistance et accompagnement	3	H9 : OS → BI
Pression environnementale (ENV)	Exigences, normes institutionnelles et disciplinaires	4	H10 : ENV → BI
Conditions facilitantes (FC)	Ressources, assistance et disponibilité des outils.	3	H11 : FC → UR
Compétences numériques (DC)	Capacité à évaluer, vérifier et utiliser l’information numérique	3	Modérateur : atténue PR → BI (H13)
Intention d’usage (BI)	Volonté d’utiliser l’IAg dans les activités académiques	3	H12 : BI → UR
Usage réel (UR)	Usage effectif et observé des outils d’IAg	4	Variable dépendante finale

Source : *Élaboration propre*

Tableau 2 : Variables modératrices du modèle conceptuel

Modérations	Abréviation	Rôle modérateur attendu
Modération des Compétences numériques	DC× PR	Modère PR → BI (H13), atténue l’effet négatif du risque perçu sur l’intention d’usage
Modération du soutien organisationnel	OS × EE	Modère EE → BI (H14), renforce l’effet de la facilité perçue sur l’intention d’usage

Source: *Élaboration propre*

Tableau 3: Variables de contrôle du modèle conceptuel

Variable de contrôle	Justification
Âge	Peut influencer l’aisance numérique, l’expérience technologique et les attitudes vis-à-vis de l’IAg. Les utilisateurs plus jeunes adoptent souvent plus rapidement les technologies émergentes.
Sexe	Peut affecter les perceptions de risque, de confiance technologique et de facilité

	d'utilisation. Plusieurs études montrent des différences dans l'adoption des technologies selon le genre.
Niveau d'études	Reflète la maturité académique, l'expérience méthodologique et les compétences numériques générales, pouvant influencer l'usage de l'IAg.
Discipline enseignée	Certaines disciplines (informatique, ingénierie, économie, etc.) mobilisent davantage l'IAg, disposent d'une culture numérique plus forte et favorisent des usages plus fréquents et plus avancés.
Fréquence d'utilisation des outils d'IAg	Indique le degré d'exposition et de familiarité avec l'IAg. Une utilisation plus fréquente est généralement associée à une meilleure maîtrise, une confiance accrue et une adoption plus élevée.

Source : Élaboration de l'auteur

4. Évaluation du modèle de mesure

L'évaluation du modèle de mesure a été réalisée conformément aux recommandations de la méthode PLS-SEM, en examinant successivement la fiabilité des indicateurs, la validité convergente et la validité discriminante.

4.1. Fiabilité des indicateurs (*Outer Loadings*)

Tableau 4 : Les loadings externes

Facteur	Items	Charges factorielles (min–max)	Exceptions
BI	BI1–BI3	0,826 – 0,874	—
DC	DC1–DC3	0,844 – 0,894	—
EE	EE1–EE3	0,908 – 0,917	EE2 supprimé
ENV	ENV1–ENV4	0,697 – 0,862	ENV3 = 0,697
ETH	ETH1–ETH4	0,817 – 0,892	—
FC	FC1–FC3	0,649 – 0,893	FC2 = 0,649
HB	HB1–HB3	0,853 – 0,879	—
HM	HM1–HM3	0,826 – 0,894	—
OS	OS1–OS3	0,787 – 0,947	—
PR	PR1–PR6	0,766 – 0,848	—

PU	PU1–PU4	0,825 – 0,851	—
SI	SI1–SI3	0,769 – 0,828	—
TR	TR1–TR3	0,756 – 0,899	—
UR	UR1–UR4	0,785 – 0,891	—
Interactions	—	—	OS×EE ; DC×PR (1.000)

Source : Résultats obtenus à l’aide de SmartPLS

L’analyse des *loadings* externes montre que la majorité des indicateurs présentent des valeurs supérieures au seuil recommandé de 0,70, indiquant une bonne fiabilité individuelle. Après suppression de l’item EE2 en raison d’un *loading* insuffisant, tous les indicateurs restants affichent des contributions satisfaisantes à leurs construits respectifs. Quelques items présentent des *loadings* légèrement inférieurs au seuil de 0,70 (notamment ENV3 = 0,697 et FC2 = 0,649), mais ont été conservés compte tenu de leur contribution théorique et du respect des autres critères de validité.

4.2. Fiabilité interne et validité convergente

Tableau 5 : Fiabilité et validité convergente

Construit	α de Cronbach	CR	AVE
BI	0.819	0.892	0.734
DC	0.838	0.903	0.756
EE	0.798	0.908	0.832
ENV	0.774	0.851	0.589
ETH	0.875	0.915	0.728
FC	0.742	0.848	0.655
HB	0.838	0.902	0.755
HM	0.832	0.899	0.749
OS	0.850	0.898	0.746
PR	0.889	0.915	0.642
PU	0.859	0.904	0.703
SI	0.726	0.845	0.645
TR	0.807	0.884	0.718
UR	0.867	0.910	0.716

Source : Résultats obtenus à l’aide de SmartPLS

La fiabilité interne a été évaluée à l'aide de l'alpha de Cronbach et de la fiabilité composite (rho-c). L'ensemble des construits présente des valeurs supérieures au seuil de 0,70, confirmant une cohérence interne satisfaisante. La validité convergente a été examinée via l'*Average Variance Extracted* (AVE). Toutes les valeurs d'AVE sont supérieures à 0,50, indiquant que chaque construit explique plus de 50 % de la variance de ses indicateurs.

4.3. Validité discriminante des construits

Critère de Fornell-Larcker

La validité discriminante a été vérifiée à l'aide du critère de *Fornell-Larcker*. Les résultats indiquent que, pour chaque construit, la racine carrée de l'AVE est supérieure aux corrélations avec les autres construits, confirmant ainsi une distinction adéquate entre les concepts. Certaines corrélations relativement élevées ont été observées, notamment entre la motivation hédonique et l'utilité perçue, ainsi qu'entre l'intention d'usage et l'usage réel, mais ces relations restent théoriquement cohérentes et ne remettent pas en cause la validité du modèle.

Tableau 6 : Validité discriminante selon le critère de Fornell-Larcker

	BI	DC	EE	ENV	ETH	FC	HB	HM	OS	PR	PU	SI	TR	UR
BI	0.857	0.442	0.514	0.349	0.522	0.389	0.532	0.575	0.094	0.325	0.556	0.521	0.479	0.685
DC	0.442	0.869	0.346	0.239	0.584	0.312	0.322	0.472	0.117	0.465	0.380	0.342	0.399	0.359
EE	0.514	0.346	0.912	0.300	0.369	0.378	0.544	0.567	0.125	0.305	0.646	0.529	0.521	0.455
ENV	0.349	0.239	0.300	0.767	0.306	0.385	0.296	0.470	0.641	0.131	0.392	0.451	0.506	0.426
ETH	0.522	0.584	0.369	0.306	0.853	0.367	0.306	0.452	0.116	0.466	0.447	0.371	0.430	0.435
FC	0.389	0.312	0.378	0.385	0.367	0.809	0.336	0.467	0.311	0.117	0.352	0.385	0.467	0.478
HB	0.532	0.322	0.544	0.296	0.306	0.336	0.869	0.576	0.173	0.328	0.536	0.505	0.481	0.546
HM	0.575	0.472	0.567	0.470	0.452	0.467	0.576	0.865	0.215	0.427	0.705	0.581	0.560	0.625
OS	0.094	0.117	0.125	0.641	0.116	0.311	0.173	0.215	0.864	-0.100	0.156	0.229	0.345	0.230
PR	0.325	0.465	0.305	0.131	0.466	0.117	0.328	0.427	-0.100	0.802	0.407	0.307	0.202	0.276
PU	0.556	0.380	0.646	0.392	0.447	0.352	0.536	0.705	0.156	0.407	0.838	0.556	0.551	0.543
SI	0.521	0.342	0.529	0.451	0.371	0.385	0.505	0.581	0.229	0.307	0.556	0.803	0.480	0.496
TR	0.479	0.399	0.521	0.506	0.430	0.467	0.481	0.560	0.345	0.202	0.551	0.480	0.848	0.545
UR	0.685	0.359	0.455	0.426	0.435	0.478	0.546	0.625	0.230	0.276	0.543	0.496	0.545	0.846

Source : Résultats obtenus à l'aide de SmartPLS

Note : Les valeurs en diagonale représentent la racine carrée de l'AVE. Les corrélations inter-construits sont présentées hors diagonale.

Ratio HTMT

L’évaluation par le ratio *Heterotrait-Monotrait* (HTMT) confirme également la validité discriminante. Toutes les valeurs sont inférieures au seuil de 0,90. Les valeurs les plus élevées concernent :

- PU ↔ HM = 0,830
- OS ↔ ENV = 0,824
- BI ↔ UR = 0,810

Ces résultats reflètent des proximités conceptuelles attendues sans compromettre la distinction entre les construits.

Tableau 7 : Validité discriminante selon le critère de HTMT

	BI	DC	EE	ENV	ETH	FC	HB	HM	OS	PR	PU	SI	TR	UR
DC	0.533													
EE	0.636	0.421												
ENV	0.406	0.296	0.342											
ETH	0.616	0.682	0.440	0.358										
FC	0.466	0.392	0.457	0.504	0.441									
HB	0.643	0.383	0.666	0.334	0.357	0.401								
HM	0.695	0.563	0.692	0.562	0.526	0.565	0.687							
OS	0.116	0.135	0.133	0.824	0.119	0.419	0.203	0.235						
PR	0.375	0.532	0.366	0.168	0.519	0.138	0.384	0.491	0.103					
PU	0.660	0.447	0.781	0.441	0.516	0.407	0.631	0.830	0.164	0.465				
SI	0.670	0.429	0.687	0.566	0.458	0.479	0.643	0.743	0.278	0.368	0.699			
TR	0.570	0.481	0.627	0.629	0.515	0.590	0.565	0.679	0.426	0.237	0.646	0.608		
UR	0.810	0.418	0.548	0.499	0.497	0.563	0.643	0.731	0.253	0.310	0.627	0.622	0.638	

Source : Résultats obtenus à l’aide de SmartPLS

Cross-loadings

L’analyse des *cross-loadings* montre que chaque indicateur charge plus fortement sur son construit associé que sur les autres construits, confirmant la validité discriminante au niveau des items.

Un cas limite a été observé pour l’item ENV1, dont la charge est proche de celle du construit OS. Toutefois, cette différence reste marginale et n’affecte pas la validité globale du modèle.

4.4. Évaluation de la colinéarité du modèle structurel

Tableau 8 : VIF du modèle structurel (Inner Model list)

Relation	VIF
BI $\rightarrow$ UR	1.179
FC $\rightarrow$ UR	1.179
DC $\rightarrow$ BI	1.845
DC $\times$ PR $\rightarrow$ BI	1.292
EE $\rightarrow$ BI	2.060
ENV $\rightarrow$ BI	2.393
ETH $\rightarrow$ BI	1.823
HB $\rightarrow$ BI	1.806
HM $\rightarrow$ BI	2.767
OS $\rightarrow$ BI	1.883
OS $\times$ EE $\rightarrow$ BI	1.166
PR $\rightarrow$ BI	1.617
PU $\rightarrow$ BI	2.639
SI $\rightarrow$ BI	1.870
TR $\rightarrow$ BI	2.126

Source : Résultats obtenus à l'aide de SmartPLS

La colinéarité a été évaluée à l'aide du *Variance Inflation Factor* (VIF). Les résultats obtenus indiquent que toutes les valeurs de VIF sont inférieures au seuil critique de 3, ce qui confirme l'absence de problèmes de multi-colinéarité au sein du modèle structurel. Les valeurs de VIF observées varient entre 1.166 et 2.767, ce qui indique :

- Une absence totale de colinéarité problématique
- Une bonne indépendance des variables explicatives
- Une stabilité des estimations des coefficients de régression

Les valeurs les plus élevées concernent la motivation hédonique (HM $\rightarrow$ BI = 2.767) et l'utilité perçue (PU $\rightarrow$ BI = 2.639), ce qui reste largement en dessous des seuils critiques et reflète une proximité conceptuelle attendue dans les modèles d'acceptation technologique. Par ailleurs, les variables d'interaction introduites pour tester les effets de modulation (OS $\times$ EE et DC $\times$ PR) présentent des niveaux de colinéarité très faibles, confirmant la bonne spécification des effets modérateurs. Ces résultats confirment que le modèle

structurel ne souffre d’aucun problème de multi-colinéarité. Les relations estimées peuvent ainsi être interprétées de manière fiable, sans biais lié à une redondance excessive entre les variables explicatives.

L’analyse du *Variance Inflation Factor* (VIF) pour l’*outer model* a été effectuée afin de détecter toute multi-colinéarité entre les indicateurs de chaque construit. Les résultats montrent que tous les items présentent des valeurs de VIF inférieures à 5, la majorité étant comprise entre 1,3 et 2,7, ce qui indique une faible redondance entre les items et une bonne diversité d’information apportée par chaque indicateur. Seuls les items PR5 et PR6 présentent des VIF légèrement supérieurs à 3,3, ce qui reste acceptable selon les recommandations de SmartPLS et ne constitue pas un problème critique de multi-colinéarité. Les interactions modératrices (DC x PR et OS x EE) présentent un VIF égal à 1, confirmant l’absence de colinéarité dans les variables modératrices. Ainsi, les résultats confirment que les indicateurs mesurent de manière distincte leurs construits respectifs, assurant la fiabilité et la validité du modèle externe.

4.5. Conclusion du modèle de mesure

L’ensemble des résultats confirme la robustesse du modèle de mesure. Les indicateurs présentent une fiabilité satisfaisante, les construits démontrent une validité convergente adéquate, et la validité discriminante est établie à travers plusieurs critères complémentaires (*Fornell-Larcker*, HTMT et *cross-loadings*). Par ailleurs, l’absence de problèmes de colinéarité renforce la qualité méthodologique du modèle. Ces résultats permettent de conclure que le modèle de mesure est adéquatement spécifié et peut être utilisé de manière fiable pour l’évaluation du modèle structurel.

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Déclaration d'utilisation de l'IA générative

L'outil ChatGPT a été utilisé à titre d'assistance pour la recherche bibliographique et l'amélioration de la qualité linguistique du manuscrit, notamment pour la recherche de références, la reformulation et la vérification linguistique du texte. Son usage n'a pas concerné l'analyse des résultats ni les interprétations scientifiques. Le manuscrit a été vérifié et validé par les auteurs, qui assument l'entière responsabilité scientifique et éthique.

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L'IA générative dans l'enseignement supérieur tunisien

Seconde partie : Discussion des résultats empiriques
sur les pratiques d'intégrité durables

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Mots clés

Intelligence artificielle, IA générative, IAg, adoption technologique, PLS-SEM, intention d'usage, usage réel, éthique, enseignement supérieur tunisien.

Résumé

Dans le prolongement de la première partie de cette recherche, consacrée au développement du cadre conceptuel et à la validation du modèle de mesure, cette seconde partie analyse les résultats empiriques du modèle structurel. Les résultats attestent d'un pouvoir explicatif élevé ($R^2BI = 0,551$; $R^2UR = 0,522$). L'intention d'usage influence fortement l'usage réel ($\beta = 0,588$; $p < 0,001$), tandis que les conditions facilitantes exercent un effet positif significatif ($\beta = 0,249$; $p < 0,001$). Contrairement aux modèles classiques, l'utilité perçue et la facilité d'utilisation ne sont pas significatives. À l'inverse, l'éthique perçue ($\beta = 0,244$; $p = 0,002$), l'habitude ($\beta = 0,214$; $p = 0,008$) et le soutien organisationnel ($\beta = -0,181$; $p = 0,025$) constituent des déterminants clés. L'effet modérateur du soutien organisationnel est également confirmé ($\beta = 0,189$; $p = 0,005$). Ces résultats révèlent un déplacement des déterminants de l'adoption vers des dimensions éthiques, comportementales et organisationnelles, avec d'importantes implications théoriques, managériales et sociétales.

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1. Introduction

L'essor rapide de l'intelligence artificielle générative (IAg), inscrit dans une dynamique plus large de développement de l'intelligence artificielle en éducation, contribue à transformer les pratiques pédagogiques, la conception des cours et les modes d'apprentissage dans l'enseignement supérieur (Dwivedi et al. 2023 ; Zawacki-Richter et al. 2019). Dans ce contexte, les universités cherchent à intégrer des outils susceptibles d'améliorer l'efficacité pédagogique, de renforcer l'engagement des étudiants et de soutenir l'innovation éducative. Des études récentes montrent que l'intégration d'outils d'intelligence artificielle dans les environnements universitaires est associée à une augmentation de l'engagement étudiant (Ezeoguine/Eteng-Uket 2024) et peut favoriser des pratiques pédagogiques plus innovantes lorsque leur usage est ancré dans des dispositifs pédagogiques adaptés (Noroozi 2025), tout en contribuant à des améliorations de l'enseignement et de l'apprentissage lorsqu'elle est structurée de manière appropriée (Schmidt et al. 2025).

Toutefois, malgré ces bénéfices potentiels, l'adoption effective de l'intelligence artificielle générative demeure hétérogène dans l'enseignement supérieur. Cette hétérogénéité s'explique par l'interaction de facteurs individuels, organisationnels et environnementaux (Venkatesh et al. 2003; Tornatzky/Fleischer 1990), ainsi que par des risques perçus susceptibles de freiner l'usage réel de ces technologies, notamment en termes de perte de contrôle sur les apprentissages, de fiabilité des productions, d'enjeux éthiques et de confidentialité des données (Ameen et al. 2021 ; Pramjeeth /Ramgovind 2024). La littérature récente met ainsi en évidence un intérêt croissant pour l'IAg dans les recherches en éducation, tout en soulignant des défis pédagogiques, éthiques et pratiques qui influencent directement les modalités d'appropriation et d'usage de ces technologies (Lee et al. 2025).

Dans ce cadre, les modèles classiques d'adoption technologique, mobilisés de manière isolée, peuvent apparaître limités pour expliquer les comportements d'intention d'usage et d'usage effectif de l'IAg, caractérisée par un niveau élevé d'autonomie, d'automatisation et d'incertitude. Des travaux récents plaident en faveur d'une articulation de cadres théoriques

complémentaires, notamment le *Technology Acceptance Model* (TAM), l’*Unified Theory of Acceptance and Use of Technology* (UTAUT/UTAUT2) et le cadre *Technology-Organization-Environment* (TOE), afin de mieux appréhender la complexité des mécanismes d’adoption dans des environnements numériques avancés (Aboura 2025 ; Khlaif et al. 2024 ; Granić 2025). Cette approche intégrative est particulièrement pertinente dans le champ éducatif, où les compétences numériques des utilisateurs et le soutien organisationnel jouent un rôle central comme déterminants directs de l’appropriation des technologies émergentes (Venkatesh et al. 2003 ; Venkatesh et al. 2012 ; Hatlevik/ Christophersen 2013 ; Dringó Horváth et al. 2025). Au-delà de leurs effets directs sur l’adoption et l’usage des technologies, ces variables peuvent également être envisagées, dans une perspective exploratoire, comme susceptibles d’exercer un rôle de modération.

S’inscrivant dans cette perspective, la présente étude propose un modèle conceptuel intégratif combinant le TAM, l’UTAUT/UTAUT2 et le cadre TOE, enrichi par le modèle des risques perçus, tel que proposé par Featherman et Pavlou (2003), ainsi que par des considérations éthiques. Ce modèle intègre également des variables modératrices clés, en particulier les compétences numériques des étudiants et le soutien organisationnel perçu, afin de mieux appréhender la manière dont ces facteurs influencent les mécanismes sous-jacents à l’intention d’adoption et à l’usage effectif de l’intelligence artificielle générative dans l’enseignement supérieur. Il vise ainsi à analyser de manière systématique les déterminants de l’intention d’adoption et de l’usage effectif de l’intelligence artificielle générative par les étudiants de l’enseignement supérieur, en offrant un cadre explicatif empirique susceptible de contribuer à l’avancement des travaux sur l’adoption des technologies éducatives avancées et d’éclairer les décisions institutionnelles.

Compte tenu de ces considérations, plusieurs objectifs spécifiques ont été retenus :

- Identifier les facteurs cognitifs et perceptuels influençant l’intention d’usage des outils d’IAg.

- Examiner les dimensions organisationnelles, technologiques et environnementales qui conditionnent leur adoption au sein des institutions universitaires.
- Évaluer l'influence des risques perçus, des compétences numériques et des considérations éthiques, notamment la transparence, la responsabilité, l'équité et les pratiques d'usage responsable, sur l'adoption et l'usage effectif de l'IAg.
- Proposer un modèle conceptuel intégratif, articulant les apports théoriques de TAM, UTAUT, UTAUT2, du cadre TOE et du modèle du risque perçu, tout en intégrant la dimension éthique.

Cette réflexion conduit à formuler la question de recherche suivante : *Quels sont les déterminants individuels, organisationnels, technologiques, perceptuels et éthiques qui influencent l'intention d'usage et l'usage effectif de l'intelligence artificielle générative par les étudiants dans l'enseignement supérieur Tunisien ?*

Afin d'apporter une réponse approfondie, plusieurs questions spécifiques seront examinées :

- Comment les facteurs issus de TAM/UTAUT/UTAUT2 influencent-ils l'intention d'usage ?
- Dans quelle mesure les facteurs institutionnels du cadre TOE affectent-ils l'adoption ?
- Quel est l'impact des risques perçus sur l'intention d'usage ?
- Dans quelle mesure les compétences numériques modèrent-elles les effets perçus des risques ?
- Comment les considérations éthiques influencent-elles l'intention d'usage et l'usage effectif de l'IAg ?
- Comment ces différents facteurs convergent-ils pour expliquer l'usage effectif ?

Cette seconde partie prolonge une recherche consacrée à l'adoption de l'intelligence artificielle générative dans l'enseignement supérieur tunisien et à ses implications en matière d'intégrité académique. Elle analyse le modèle structurel et interprète les résultats empiriques obtenus à l'aide de l'approche

PLS-SEM. Plus précisément, elle examine les relations structurelles entre les construits du modèle, évalue les hypothèses formulées dans le première partie et met en évidence les mécanismes d’adoption de l’intelligence artificielle générative dans le contexte universitaire tunisien. Les résultats sont discutés à la lumière de la littérature existante afin d’en dégager les implications théoriques, managériales et sociétales. Enfin, sont présentées les principales contributions de la recherche, ses limites ainsi que les perspectives de recherche futures.

2. Discussion des résultats

2.1. L’analyse descriptive des perceptions des étudiants

Tableau 1: Synthèse des résultats descriptifs

Variable / Question	Modalité principale	Effectifs (n)	%
Q1. Utilisation de l’IAG	Oui	221	91,3 %
	Non	21	8,7 %
Q2. Fréquence d’utilisation	Occasionnellement / Souvent	175	79,2 %
	Très souvent	20	9 %
Q3. Outils utilisés	ChatGPT	197	89,1 %
	Gemini	132	59,7 %
	Autres outils	-	< 22 %
Q4. Finalités d’usage	Résumé / Explication ou clarification du cours	156 / 135	70,6 % / 61,1 %
	Recherche documentaire / Reformulation de texte	118/117	≅53 %
	Correction linguistique / Rédaction de texte	76/72	≅ 35 % /33 %
	Programmation/ codage	42	19%
	Génération multimédia	77	≅ 35 %
Q5. Utilité perçue (PU)	Accord global élevé pour tous les items	-	> 69 %
Q6. Facilité d’usage (EE)	Accord global modéré	-	~45% - 60 %
	Pairs dominants	161	72,9 %

Q7. Influence sociale (SI)	Rôle des enseignants faibles	74	33,5%
	Influence institutionnelle limitée	102	46%
Q8. Motivation hédonique (HM)	Accord général élevé	-	≅ 70 %
Q9. Habitude (HB)	Usage routinisé partiel	-	~41-67 %
Q10. Risques perçus (PR)	Accord général modéré à élevé	-	~ 50-63 %
Q11. Préparation technologique (TR)	Accord général modéré	-	~ 54-68%
Q11. Soutien organisationnel (OS)	Désaccord dominant	-	~62%-68 % négatif
Q11. Pression de l'environnement (ENV)	Mitigé	-	~37%-57 %
Q12. Conditions facilitantes (FC)	Accord modéré	-	~44-62 %
Q13. Compétences numériques (DC)	Accord élevé	-	~70 %
Q14. Éthique (ETH)	Accord élevé	-	~66-71 %
Q15. Intention d'usage (BI)	Accord élevé	-	≅ 70 %
Q16. Usage réel (UR)	Usage effectif élevé	-	~ 51-81%
Q17. Commentaires et suggestions	La pluparts des réflexions convergent vers : l'IAg comme outil de soutien performant, usage critique pour éviter toute dépendance excessive et manque d'encadrement institutionnel		
Q18. Niveau d'étude	Licence (L3 dominante)	91	37,6 %
Q19. Âge	21–24 ans	158	65,3 %
Q20. Sexe	Femme	204	84,3 %
Q21. Discipline	Économie et Gestion	181	74,8 %

Source : Élaboration propre à partir de Google Forms

Au regard des résultats descriptifs, plusieurs constats majeurs émergent. D’une part, l’adoption de l’intelligence artificielle générative apparaît particulièrement élevée et largement ancrée dans les pratiques académiques des étudiants, comme en témoigne le taux très important d’utilisateurs et la fréquence d’usage majoritairement régulière. Cette diffusion s’inscrit dans une logique d’appropriation pragmatique, où les outils sont principalement mobilisés pour des finalités académiques telles que la compréhension des cours, la synthèse de contenus et la production écrite, traduisant une orientation essentiellement utilitaire.

D’autre part, cette adoption s’accompagne de perceptions contrastées, combinant une utilité perçue élevée et une motivation importante, avec une facilité d’usage plus modérée, suggérant que l’IAg, bien qu’efficace, requiert encore un certain effort d’appropriation. Parallèlement, les étudiants manifestent une conscience non négligeable des risques associés (erreurs, dépendance cognitive, enjeux de plagiat), ainsi qu’un niveau relativement élevé de sensibilité éthique, ce qui traduit une adoption à la fois opportuniste et réflexive.

En outre, l’analyse met en évidence une dynamique sociale spécifique, où l’influence des pairs joue un rôle déterminant, contrairement à celle des enseignants et de l’institution, qui demeure limitée. Ce résultat souligne un processus d’adoption principalement horizontal, reposant davantage sur les interactions entre étudiants que sur des dispositifs formels d’encadrement.

Par ailleurs, si les conditions techniques et les compétences numériques apparaissent globalement favorables, le soutien organisationnel est perçu comme insuffisant, révélant un déficit d’accompagnement institutionnel. Cette situation contribue à un contexte d’usage relativement autonome, caractérisé par une régulation faible et une certaine ambiguïté normative.

Enfin, l’intention d’usage élevée, combinée à un niveau d’usage effectif déjà important, confirme que l’IAg s’inscrit durablement dans les pratiques académiques. Dans l’ensemble, ces résultats descriptifs mettent en évidence une adoption avancée mais encore en phase de structuration, marquée par un déplacement progressif des enjeux vers des dimensions éthiques,

comportementales et contextuelles, qui seront approfondies dans l'analyse du modèle structurel.

Ces premiers résultats, bien que riches en enseignements, restent essentiellement descriptifs et ne permettent pas d'évaluer de manière rigoureuse les relations causales entre les variables ni de tester les hypothèses du modèle conceptuel proposé. En particulier, ils ne permettent pas d'identifier les déterminants significatifs de l'intention d'usage (BI) et de l'usage réel (UR), ni d'examiner les effets spécifiques de variables clés telles que les considérations éthiques, les risques perçus ou encore les interactions modératrices.

Dans cette perspective, le recours à la modélisation par équations structurelles basée sur les moindres carrés partiels (PLS-SEM) s'impose comme une approche méthodologique particulièrement adaptée. Cette méthode permet en effet d'analyser simultanément les relations entre variables latentes, d'évaluer la qualité du modèle de mesure et de tester la robustesse du modèle structurel en termes de pouvoir explicatif et prédictif.

Dans le prolongement de l'évaluation du modèle de mesure réalisée dans la première partie de cette recherche, l'approche PLS-SEM est mobilisée dans cette seconde partie afin de :

- Évaluer le modèle structurel, en testant les hypothèses de recherche à travers les coefficients de régression, leur significativité statistique et les tailles d'effet ;
- Et enfin, apprécier la capacité prédictive du modèle, notamment à travers les indicateurs R^2 , f^2 et Q^2 .

Cette démarche permettra de dépasser une lecture descriptive des données pour proposer une analyse explicative approfondie des mécanismes d'adoption de l'IAg dans le contexte de l'enseignement supérieur Tunisien.

2.2. Résultats des relations structurelles

Le tableau suivant présente les résultats de l'estimation du modèle structurel, incluant les coefficients de chemin standardisés (β), les statistiques t , les niveaux de significativité (p -values), ainsi que les décisions relatives à la validation des hypothèses.

Tableau 2 : Résultats des relations structurelles

Relation	β	t	p	Résultat
BI $\rightarrow$ UR	0.588	10.452	0.000	Confirmée
FC $\rightarrow$ UR	0.249	4.506	0.000	Confirmée
ETH $\rightarrow$ BI	0.244	3.150	0.002	Confirmée
HB $\rightarrow$ BI	0.214	2.664	0.008	Confirmée
OS $\rightarrow$ BI	- 0.181	2.241	0.025	Confirmée
OS $\times$ EE $\rightarrow$ BI	0.189	2.832	0.005	Modération confirmée
DC $\times$ PR $\rightarrow$ BI	- 0.029	0.424	0.671	Modération non confirmée
Autres relations	-	-	> 0.05	Non confirmées

Source : Résultats obtenus à l’aide de SmartPLS

2.3. Rôle central de l’intention dans l’usage réel

Le résultat le plus marquant de cette étude est l’effet très significatif de l’intention d’usage sur l’usage réel ($\beta = 0.588$; $p < 0.001$), associé à une taille d’effet très forte ($f^2 = 0.613$). Ce résultat confirme les fondements des modèles comportementaux tels que le TAM et l’UTAUT, selon lesquels l’intention constitue le principal prédicteur du comportement effectif. Dans le contexte de l’IAg, cela suggère que l’adoption réelle par les étudiants dépend avant tout de leur disposition psychologique à intégrer ces outils dans leurs pratiques académiques.

Par ailleurs, les conditions facilitantes exercent également un effet significatif sur l’usage réel ($\beta = 0.249$; $p < 0.001$), traduisant l’importance de la disponibilité des ressources techniques et de l’assistance.

2.4. Une adoption fortement influencée par des facteurs éthiques et comportementaux

Contrairement aux modèles classiques d’acceptation technologique, les résultats montrent que l’utilité perçue (PU) et la facilité d’utilisation (EE) n’ont pas d’effet significatif sur l’intention d’usage.

À l’inverse, l’éthique perçue (ETH) apparaît comme un déterminant majeur de l’intention d’usage ($\beta = 0.244$; $p = 0.002$), ce qui constitue un résultat

particulièrement saillant. Ce résultat suggère que, dans le contexte de l'enseignement supérieur, la décision d'utiliser l'IAg ne repose pas uniquement sur une évaluation instrumentale de ses bénéfices, mais s'inscrit dans un cadre normatif et institutionnel fortement intériorisé par les étudiants. En effet, ces derniers semblent intégrer de manière proactive les exigences liées à l'intégrité académique, notamment en matière de plagiat, de conformité aux règles universitaires et de légitimité de l'usage des technologies.

Plus encore, l'éthique perçue agit ici comme un mécanisme de régulation cognitive et comportementale, orientant l'intention d'usage en fonction de ce qui est jugé acceptable ou non dans le contexte académique. Ce résultat peut être interprété comme le reflet d'une « *conscience algorithmique* » croissante, où les utilisateurs ne se contentent plus d'évaluer l'utilité ou la facilité d'un outil, mais questionnent également ses implications éthiques et ses conditions d'usage. Dans un environnement caractérisé par une absence relative de cadres institutionnels clairs, cette dimension éthique devient un repère central pour guider les comportements.

Ainsi, l'éthique ne constitue pas seulement un frein potentiel, comme le suggèrent certains travaux, mais peut également agir comme un levier positif d'adoption, en renforçant la légitimité perçue de l'usage lorsque celui-ci est jugé conforme aux normes académiques. Ce résultat contribue à enrichir les modèles classiques d'acceptation technologique en soulignant l'importance d'intégrer explicitement les dimensions normatives et institutionnelles dans l'analyse des comportements d'adoption, en particulier pour les technologies émergentes telles que l'IAg.

De même, l'habitude (HB) influence significativement l'intention d'usage ($\beta = 0.214$; $p = 0.008$), suggérant que l'usage de l'IAg tend à se routiniser rapidement, indépendamment de l'évaluation cognitive classique des technologies.

2.5. Un effet paradoxal du soutien organisationnel

Un résultat particulièrement intéressant concerne le soutien organisationnel (OS), qui présente un effet direct négatif sur l’intention d’usage ($\beta = -0.181$; $p = 0.025$). Ce résultat peut sembler contre-intuitif, mais il peut être interprété à la lumière du contexte spécifique de l’enseignement supérieur tunisien. En effet, l’absence de cadres institutionnels clairs, de politiques formalisées et de dispositifs de formation structurés autour de l’IAg peut générer :

- Une incertitude normative
- Une perception de risque institutionnel
- Une ambiguïté quant à la légitimité de l’usage

Ainsi, un soutien perçu comme insuffisant ou incohérent pourrait freiner l’intention d’usage plutôt que la renforcer. Cependant, l’effet de modération du soutien organisationnel sur la relation entre la facilité d’utilisation et l’intention ($\beta = 0.189$; $p = 0.005$) est positif et significatif.

Tableau 3 : Effets de modération

Interaction	β	p	Interprétation
OS $\times$ EE $\rightarrow$ BI	0.189	0.005	Modération positive
DC $\times$ PR $\rightarrow$ BI	- 0.029	0.671	Non significative

Source : Résultats obtenus à l’aide de SmartPLS

Ce résultat suggère que, lorsque le soutien organisationnel est perçu comme adéquat, la facilité d’utilisation devient plus déterminante dans la formation de l’intention.

2.6. Faible influence des variables classiques

Plusieurs variables traditionnellement centrales dans les modèles d’adoption (PU, EE, SI, HM, TR, PR) ne présentent pas d’effets significatifs. Cela indique que l’adoption de l’IAg ne suit pas une logique purement utilitariste ou technologique, mais plutôt une logique contextuelle, une logique normative (éthique) et une logique comportementale (habitude).

2.7. Validation prédictive du modèle

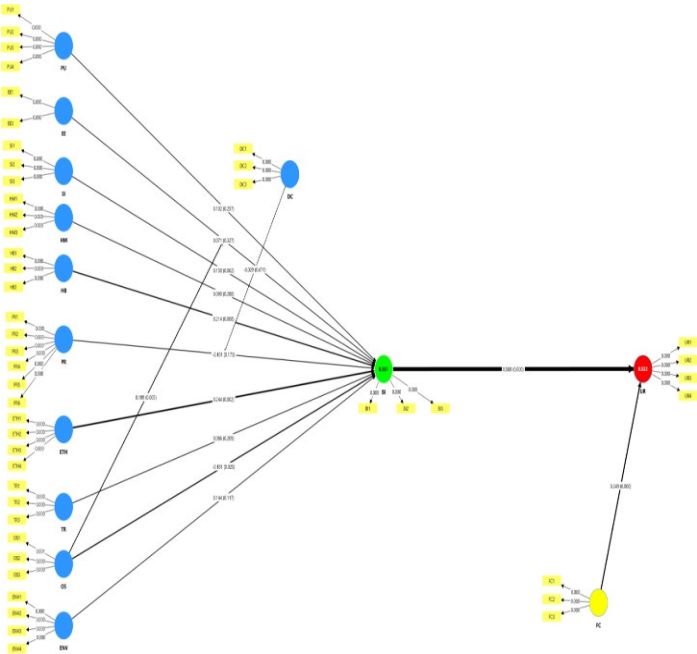
Tableau 4 (page suivante): Indicateurs prédictifs (Q^2 predict, RMSE, MAE)

Indicateur	Q ² predict	RMSE	MAE
BI1- BI3	0.301 - 0.370	-	-
UR1- UR4	0.257 - 0.331	-	-
BI	0.453	0.749	0.538
UR	0.420	0.771	0.594

Source : Résultats obtenus à l'aide de SmartPLS

Les résultats de la validation prédictive montrent que le modèle PLS-SEM présente une bonne capacité prédictive, tant au niveau des items individuels que des variables latentes globales. En effet, les $Q^2_{predict}$ des items BI1-BI3 et UR1-UR4 sont positifs (0.257 - 0.370), indiquant que chacun des indicateurs est correctement prédit par le modèle. Pour les variables latentes globales BI et UR, les $Q^2_{predict}$ sont respectivement de 0.453 et 0.420, et les erreurs de prédiction restent faibles et inférieures à celles du modèle linéaire, (RMSE = 0.749 et 0.771 ; MAE = 0.538 et 0.594), confirmant la robustesse et la précision prédictive du modèle.

Figure 1 : Modèle structurel Source : Élaboration propre



2.8. Effets des variables de contrôle sur les relations structurelles

Tableau 5: Relations structurelles avant et après contrôle

Relation	Avant contrôle (β)	Après contrôle (β)	Interprétation
BI → UR	0.588	0.561	Très robuste (légère diminution, effet central maintenu)
FC → UR	0.249	0.245	Stable (impact constant des conditions facilitantes)
ETH → BI	0.244	0.240	Stable (rôle clé de l'éthique confirmé)
HB → BI	0.214	0.239	Renforcé (routinisation accentuée après contrôle)
OS → BI	- 0.181	- 0.160	Stable (effet négatif robuste, légèrement atténué)
OS × EE → BI	0.189	0.183	Moderation robuste (effet maintenu)
ENV → BI	Non significatif	0.162	Devient significatif (effet contextuel révélé)
SI → BI	Non significatif	0.138	Devient significatif (influence sociale révélée)
Sexe → BI	-	- 0.310	Effet important (différences de genre)
Sexe → UR	-	0.325	Effet important (impact sur usage réel)
Spécialité → BI	-	0.299	Effet contextuel disciplinaire

Source : Résultats obtenus à l'aide de SmartPLS

L'introduction des variables de contrôle (âge, sexe, niveau d'étude, fréquence d'usage et spécialité) confirme la robustesse globale du modèle structurel. Les relations initialement significatives demeurent globalement stables après contrôle. En particulier, la relation entre l'intention d'usage et l'usage réel reste fortement significative ($\beta = 0.561$; $p < 0.001$), tout comme l'effet des conditions facilitantes sur l'usage réel ($\beta = 0.245$; $p < 0.001$).

De même, les déterminants clés de l'intention d'usage conservent leur significativité. L'éthique perçue continue d'exercer un effet positif significatif

($\beta = 0.240$; $p = 0.001$), confirmant son rôle central dans le contexte académique. L'habitude apparaît également comme un facteur robuste ($\beta = 0.239$; $p < 0.001$), traduisant la routinisation progressive de l'usage de l'IAg. Par ailleurs, le soutien organisationnel maintient un effet direct négatif significatif sur l'intention ($\beta = -0.160$; $p = 0.019$), confirmant le caractère paradoxal de cette relation. Enfin, l'effet modérateur du soutien organisationnel sur la relation entre la facilité d'utilisation et l'intention demeure significatif ($\beta = 0.183$; $p = 0.003$), attestant de la robustesse de ce mécanisme conditionnel.

Toutefois, l'intégration de ces variables révèle des effets auparavant latents. En particulier, la pression environnementale ($\beta = 0.162$; $p = 0.039$) et l'influence sociale ($\beta = 0.138$; $p = 0.024$) deviennent significatives, suggérant l'existence d'effets de suppression liés aux caractéristiques individuelles des répondants. Ces résultats mettent en évidence l'importance des dynamiques contextuelles et sociales, souvent masquées en l'absence de variables de contrôle.

Par ailleurs, les variables de contrôle révèlent des effets différenciés selon le profil des étudiants. Le sexe apparaît comme un déterminant significatif de l'intention ($\beta = -0.310$; $p = 0.027$) et de l'usage réel ($\beta = 0.325$; $p = 0.007$), indiquant des disparités comportementales dans l'adoption de l'IAg. De même, la spécialité influence significativement l'intention d'usage ($\beta = 0.299$; $p = 0.037$), soulignant le rôle du contexte disciplinaire dans les logiques d'adoption.

Afin de situer la portée de nos résultats, il est pertinent de les inscrire dans les dynamiques d'adoption de l'IAg observées en Afrique et dans la région MENA. Bien que centrée sur la Tunisie, notre étude présente plusieurs convergences avec les travaux menés au Maroc, en Algérie, en Afrique du Sud et en Tanzanie, où l'IAg transforme les pratiques pédagogiques et les modes d'appropriation technologique (Achili/Zerrouki 2024 ; Mollet 2025 ; Ouzif et al. 2025 ; Pramjeeth/Ramgovind, 2024).

Nos résultats confirment d'abord le rôle central de l'intention d'usage dans l'usage effectif de l'IAg, en cohérence avec les constats faits dans

plusieurs contextes africains où ces outils sont mobilisés comme assistants d’apprentissage pour la rédaction, la synthèse ou la génération d’idées (El Messaoudi et al. 2025 ; Mollel 2025). En Tanzanie, Mollel (2025) souligne leur usage étendu dans un contexte peu institutionnalisé, tandis qu’au Maroc, El Messaoudi et al. (2025) mettent en évidence leur contribution à la productivité académique et à l’intention d’usage.

Par ailleurs, la faible significativité de l’utilité perçue et de la facilité d’utilisation indique un affaiblissement des logiques utilitaristes classiques. Cette tendance rejoint Ouzif et al. (2025), qui observent également une perte de pouvoir explicatif des variables de performance et d’effort dans le contexte de l’IAg. L’adoption semble ainsi davantage structurée par des facteurs contextuels, normatifs et comportementaux.

Nos résultats mettent également en évidence le rôle structurant des dimensions éthiques dans l’adoption. L’éthique perçue agit comme un déterminant clé de l’intention d’usage, en cohérence avec les travaux soulignant les enjeux d’intégrité académique, de responsabilité et de préservation des capacités critiques des étudiants (Achili/Zerrouki 2024 ; Didi 2025 ; Pramjeeth/Ramgovind, 2024). En Algérie, Achili/Zerrouki (2024) soulignent notamment les risques de plagiat et de dépendance technologique, tandis qu’en Afrique du Sud, Pramjeeth/Ramgovind (2024) insistent sur les enjeux de transparence et de responsabilité académique.

Enfin, le soutien organisationnel révèle une configuration complexe. Il exerce un effet direct négatif sur l’intention d’usage, suggérant des perceptions de contraintes ou d’un accompagnement insuffisant, mais joue simultanément un rôle modérateur positif en renforçant l’effet de la facilité d’utilisation. Il apparaît ainsi comme un facteur contextuel plutôt que linéaire, dépendant du degré de maturité institutionnelle. Cette configuration rejoint les constats observés dans plusieurs pays africains et de la région MENA, où les cadres de gouvernance de l’IAg restent en structuration. L’absence de dispositifs de formation et de régulation clairs peut limiter l’efficacité du soutien institutionnel, comme le soulignent Jenfi/Zitouni (2024) au Maroc et Aboura (2025) en Algérie. Le soutien

organisationnel semble ainsi plus efficace lorsqu'il est perçu comme structuré, cohérent et légitime.

Enfin, l'intégration des variables de contrôle met en évidence des différences selon le sexe et la spécialité académique, confirmant le caractère contextualisé de l'adoption de l'IAg. Les travaux africains récents soulignent également le rôle des compétences numériques, des cultures pédagogiques et des infrastructures technologiques dans ces dynamiques d'adoption (Faouzi et al. 2025 ; Maphalala/Ajani, 2025). Dans le cas tunisien, cela suggère une appropriation globalement transversale de l'IAg, malgré des variations disciplinaires.

Dans l'ensemble, cette mise en perspective révèle une reconfiguration progressive et transnationale des déterminants de l'adoption. Les modèles classiques, notamment le TAM, perdent en pouvoir explicatif au profit de facteurs comportementaux (habitude), éthiques (conformité académique) et contextuels (environnement institutionnel). Cette évolution souligne la nécessité de cadres théoriques intégrateurs combinant le TAM, l'UTAUT et le TOE, enrichis par une dimension éthique, afin de mieux appréhender l'adoption des technologies émergentes dans l'enseignement supérieur au-delà du seul contexte tunisien.

3. Implications de la recherche

3.1. Implications théoriques

Cette recherche apporte plusieurs contributions théoriques majeures à la littérature sur l'adoption des technologies émergentes, en particulier dans le contexte de l'intelligence artificielle générative.

Premièrement, les résultats remettent en question la centralité des variables traditionnelles du *Technology Acceptance Model* (TAM). L'absence d'effet significatif de l'utilité perçue et de la facilité d'utilisation suggère que ces déterminants cognitifs perdent en pouvoir explicatif dans un contexte où la technologie est déjà largement diffusée et maîtrisée. Ce constat confirme que les modèles d'adoption classiques sont moins pertinents dans les phases de

post-adoption ou dans les environnements caractérisés par une forte accessibilité technologique.

Deuxièmement, l’étude met en évidence le rôle structurant de l’habitude comme déterminant significatif de l’intention d’usage de l’IAg. Son adoption s’inscrit dans un processus de routinisation progressive, où l’usage devient intégré aux pratiques académiques. Cette automatisation soulève toutefois un enjeu théorique lié à une possible réduction de la réflexivité cognitive, dans la mesure où la répétition de l’usage peut affaiblir l’évaluation critique des contenus et favoriser une délégation excessive des processus cognitifs. Ce risque de désengagement réflexif constitue une limite des modèles fondés sur l’habitude dans le contexte de l’IAg. Pour y répondre, des mécanismes de régulation cognitive et pédagogique peuvent être envisagés, tels que la justification des réponses générées, la vérification critique des outputs et la mobilisation explicite du raisonnement étudiant, afin de préserver un usage de l’IAg comme outil d’assistance plutôt que de substitution à la pensée critique.

Troisièmement, l’étude met en évidence l’éthique perçue comme facteur déterminant de l’intention d’usage de l’IAg. Contrairement aux approches utilitaristes classiques, les utilisateurs intègrent des dimensions normatives liées à l’intégrité académique, à la conformité institutionnelle et aux risques de dérive. Ce résultat souligne la nécessité d’intégrer explicitement une dimension éthique dans les modèles d’adoption des technologies à fort impact sociétal. Dans cette perspective, l’éthique de l’IAg peut être conceptualisée comme un construit multidimensionnel articulé autour de quatre axes complémentaires : intégrité académique, littératie en IA, autonomie cognitive et gouvernance institutionnelle, visant respectivement la transparence des usages, la compréhension des limites des systèmes génératifs, la préservation des capacités analytiques et l’encadrement normatif des usages.

Quatrièmement, les résultats confirment la pertinence des approches contextuelles, notamment à travers le cadre TOE, en mettant en évidence l’influence de l’environnement institutionnel et des dynamiques sociales. L’émergence de variables telles que la pression environnementale et l’influence sociale après introduction des variables de contrôle montre que

l'adoption de l'IAG est fortement située et dépendante de son contexte d'usage.

Enfin, cette recherche met en évidence une reconfiguration globale des déterminants de l'adoption technologique. Alors que les modèles cognitifs classiques perdent en pertinence, des facteurs comportementaux, éthiques et contextuels émergent comme des leviers explicatifs centraux.

En ce sens, cette étude propose une contribution théorique intégrative en suggérant : un modèle élargi combinant les apports du TAM, de l'UTAUT et du TOE ainsi que le modèle des risques perçus, enrichi par une dimension éthique, afin de mieux appréhender l'adoption des technologies émergentes dans l'enseignement supérieur. Ces résultats soulignent la nécessité de dépasser les approches strictement centrées sur la technologie pour adopter une lecture plus holistique de l'adoption, intégrant les dimensions socio-institutionnelles, normatives et comportementales qui structurent les usages des technologies émergentes.

3.2. Implications managériales

Les résultats mettent en évidence plusieurs implications managériales clés pour l'intégration de l'IAG dans l'enseignement supérieur tunisien. En premier lieu, le rôle déterminant de l'éthique perçue ($\beta = 0.244$; $p < 0.01$) souligne la nécessité pour les établissements de clarifier les cadres normatifs afin de réduire l'ambiguïté et de renforcer la légitimité des usages. Dans cette perspective, une politique éthique efficace de l'IAG devrait reposer sur quatre principes complémentaires : la transparence des usages via la déclaration explicite du recours aux outils génératifs, le développement de la littératie en IA à travers des formations intégrées, la protection de l'autonomie cognitive en favorisant un usage d'assistance plutôt que de substitution, et une gouvernance flexible permettant d'adapter les règles aux évolutions rapides des technologies génératives.

Ensuite, l'effet significatif de l'habitude ($\beta = 0.214$; $p < 0.01$) et la non-significativité des variables classiques du TAM indiquent que l'adoption repose davantage sur des logiques comportementales que cognitives. Dans ce contexte, les établissements doivent investir dans des programmes de

formation pratiques, centrés sur l’usage réel de l’IAg, le développement des compétences critiques et la sensibilisation aux risques (biais, fiabilité, dépendance). L’intégration de l’IAg comme compétence transversale dans les programmes de formation apparaît ainsi comme un levier stratégique.

Par ailleurs, l’effet négatif du soutien organisationnel sur l’intention ($\beta = -0.181$; $p < 0.05$), combiné à son rôle modérateur positif ($\beta = 0.189$; $p < 0.01$), révèle un effet paradoxal du contexte institutionnel. Ce résultat suggère que des dispositifs institutionnels insuffisamment structurés ou incohérents peuvent freiner l’adoption. Il est donc essentiel de renforcer le soutien organisationnel à travers des dispositifs d’accompagnement concrets (guides, ateliers, assistance technique), tout en assurant une cohérence entre discours institutionnel et pratiques effectives.

En outre, l’impact significatif des conditions facilitantes sur l’usage réel ($\beta = 0.249$; $p < 0.001$) souligne l’importance de garantir l’accès aux ressources technologiques et de réduire les barrières techniques. Parallèlement, les résultats descriptifs mettent en évidence le rôle central des pairs, ce qui invite à mobiliser les dynamiques sociales (communautés d’apprentissage, partage de pratiques) comme levier d’appropriation.

Enfin, les effets significatifs des variables de contrôle, notamment le sexe et la spécialité, indiquent la nécessité de personnaliser les dispositifs d’accompagnement selon les profils étudiants. Une approche différenciée, adaptée aux disciplines et aux niveaux d’études, permettrait ainsi d’optimiser l’efficacité des stratégies d’intégration de l’IAg.

Dans l’ensemble, ces implications suggèrent que l’intégration de l’IAg ne peut être envisagée uniquement sous un angle technologique, mais nécessite une approche globale combinant régulation, accompagnement, pédagogie et contextualisation.

3.3. Implications sociétales

Les résultats soulignent également la nécessité de promouvoir une utilisation éthique de l’IAg, de sensibiliser aux risques associés et de développer une culture numérique responsable. À un niveau plus large, cette orientation s’inscrit dans une dynamique sociétale de responsabilité numérique,

combinant sensibilisation aux risques (plagiat, dépendance cognitive, désinformation), la réduction des inégalités d'accès aux outils d'IA, ainsi que développement d'une citoyenneté numérique critique, capable d'interagir de manière éclairée avec les technologies génératives.

En définitive, cette recherche montre que l'adoption de l'IAg dans l'enseignement supérieur tunisien ne repose pas uniquement sur des considérations technologiques, mais s'inscrit dans une dynamique complexe intégrant des dimensions éthiques, comportementales et institutionnelles. Le modèle proposé offre ainsi une lecture renouvelée des mécanismes d'adoption des technologies émergentes, en mettant en lumière l'importance du contexte et des régulations dans la formation des intentions et des usages.

4. Conclusion

Cette recherche avait pour objectif d'analyser les déterminants de l'adoption de l'intelligence artificielle générative (IAg) dans le contexte de l'enseignement supérieur tunisien, en mobilisant un modèle intégrateur combinant des variables issues des approches classiques d'acceptation technologique enrichies par les risques perçus et les considérations éthiques. L'analyse empirique, réalisée à l'aide de la méthode PLS-SEM, a permis de mettre en évidence plusieurs résultats significatifs contribuant à une meilleure compréhension des mécanismes d'adoption de ces technologies émergentes.

Les résultats montrent que l'intention d'usage constitue le principal déterminant de l'usage réel de l'IAg, confirmant ainsi les fondements des modèles comportementaux. Par ailleurs, les conditions facilitantes jouent un rôle complémentaire mais significatif dans l'explication de l'usage effectif. Ces résultats soulignent l'importance des dimensions à la fois psychologiques et contextuelles dans le passage de l'intention à l'action.

Cependant, l'un des apports majeurs de cette recherche réside dans la mise en évidence du rôle central des facteurs éthiques et comportementaux. L'éthique perçue apparaît comme un déterminant significatif de l'intention d'usage, ce qui traduit une sensibilité accrue des étudiants aux enjeux de conformité académique et d'intégrité dans l'utilisation de l'IAg. De même, l'habitude

influence significativement l’intention, suggérant que l’usage de ces technologies s’inscrit progressivement dans des routines académiques.

En revanche, les variables traditionnellement centrales dans les modèles d’adoption, telles que l’utilité perçue ou la facilité d’utilisation, ne présentent pas d’effet significatif. Ce résultat indique un déplacement des logiques d’adoption vers des dimensions plus contextuelles et normatives, propres aux technologies d’intelligence artificielle générative.

Un autre résultat notable concerne l’effet négatif du soutien organisationnel sur l’intention d’usage. Ce constat, en apparence paradoxal, s’explique par le contexte institutionnel caractérisé par une absence relative de cadres réglementaires clairs, de politiques formalisées et de dispositifs de formation adaptés à l’IAg. Toutefois, l’effet modérateur positif du soutien organisationnel sur la relation entre la facilité d’utilisation et l’intention souligne que ce facteur peut devenir un levier d’adoption lorsqu’il est structuré et cohérent.

Enfin, la validation prédictive du modèle confirme sa robustesse et sa capacité à expliquer et prédire les comportements d’usage dans ce contexte spécifique.

Dans une perspective plus large, face au risque de substitution de l’intelligence humaine par l’IAg dans l’enseignement supérieur, celle-ci doit être envisagée comme un outil d’augmentation des capacités cognitives plutôt que comme un substitut. L’humain doit ainsi conserver un rôle central dans l’analyse, l’interprétation et la validation des contenus générés. Afin de prévenir ce risque, plusieurs leviers peuvent être mobilisés. Sur le plan pédagogique, il convient de renforcer la pensée critique, l’usage réflexif de l’IAg, la justification des raisonnements et la vérification des productions générées. Sur le plan évaluatif, une réorientation vers des tâches analytiques, argumentatives et réflexives permettrait de limiter la substitution cognitive et de renforcer l’engagement intellectuel des étudiants. Enfin, sur le plan institutionnel, des formations à l’usage éthique et responsable de l’IAg contribueraient à préserver l’autonomie intellectuelle tout en favorisant une intégration équilibrée de ces technologies dans l’enseignement supérieur.

Globalement, cette recherche apporte une contribution significative à la littérature en proposant une lecture renouvelée de l'adoption des technologies d'IAg, intégrant des dimensions éthiques, comportementales et institutionnelles souvent négligées dans les modèles traditionnels.

Limites de la recherche

Malgré ses contributions, cette recherche présente plusieurs limites. Tout d'abord, la nature de l'échantillon peut restreindre la généralisation des résultats, celui-ci étant spécifique au contexte étudié malgré son adéquation à l'approche PLS-SEM. Ensuite, l'usage de données auto-déclarées peut introduire des biais de désirabilité sociale et de perception, particulièrement sensibles dans le contexte de l'IAg. Par ailleurs, le recours à une approche transversale ne permet pas de saisir la dynamique évolutive de l'adoption. En outre, certaines relations issues des modèles TAM et UTAUT ne sont pas confirmées, ce qui suggère, bien que ces résultats soient interprétables, que d'autres variables explicatives non intégrées au modèle pourraient jouer un rôle dans ce contexte. Enfin, l'absence de données qualitatives ou contextuelles approfondies limite la compréhension fine des mécanismes sous-jacents aux comportements observés.

Perspectives de recherche

À la lumière des limites identifiées, plusieurs pistes de recherche futures peuvent être envisagées. Tout d'abord, des études longitudinales permettraient d'analyser l'évolution de l'adoption de l'IAg dans le temps, en tenant compte de la maturité technologique et des transformations institutionnelles, afin de mieux comprendre la dynamique des processus d'adoption. Ensuite, il serait pertinent d'étendre l'analyse à d'autres contextes géographiques et culturels afin de comparer les déterminants de l'adoption de l'IAg entre systèmes éducatifs et d'identifier le rôle des facteurs institutionnels et culturels. Par ailleurs, l'intégration de méthodes qualitatives (entretiens, études de cas) enrichirait l'analyse en approfondissant les perceptions des étudiants et des enseignants. De futures recherches pourraient également explorer d'autres variables explicatives, telles que la confiance dans l'IAg, la transparence algorithmique, la perception du contrôle ou la dépendance technologique. En outre, l'examen des effets différenciés selon

les disciplines, les niveaux d’études et les profils d’utilisateurs permettrait d’identifier des logiques d’adoption spécifiques. Enfin, l’analyse des impacts à long terme de l’IAg sur les pratiques pédagogiques, les performances académiques et les compétences des étudiants constitue une voie de recherche particulièrement prometteuse.

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Ethical Readiness for Responsible AI in Higher Education

A Pre-deployment Institutional Governance Framework

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Keywords

Artificial intelligence; higher education; AI governance; ethical readiness; institutional accountability; academic integrity

Abstract

The rapid integration of Artificial Intelligence (AI) across higher education institutions has generated substantial governance challenges concerning accountability, transparency, oversight, and responsible deployment. While existing Responsible AI governance frameworks provide normative principles for ethical AI practice, a persistent gap remains between institutional governance commitments and the governance capability required to operationalise those commitments effectively. This paper introduces Ethical Readiness as a governance-precondition framework designed specifically for higher education environments. Ethical Readiness is defined as the institutional governance condition in which accountability structures, governance ownership mechanisms, oversight capability, transparency preparedness, corrective governance capacity, governance adaptability, and governance proportionality are sufficiently developed to support Responsible AI deployment before operational implementation occurs. Adopting a conceptual-theoretical research design, the paper synthesises scholarship across Responsible AI governance, higher education governance, organisational readiness, governance maturity, and institutional legitimacy theory. The framework is operationalised through eight interdependent governance dimensions and a seven-stage governance lifecycle model. Institutional applicability is illustrated through comparative analysis of five AI deployment contexts common in higher education, supported by evidence from emerging university governance initiatives. The study contributes to Responsible AI governance scholarship by introducing governance preparedness as a distinct analytical construct, differentiating Ethical Readiness from governance maturity, organisational readiness, and Responsible AI frameworks, and providing a structured governance architecture capable of supporting institutional reflection and future empirical investigation.

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1. Introduction

Artificial intelligence is reshaping higher education at a pace that governance structures have struggled to match. Universities now deploy AI-enabled technologies across teaching, student support, research, assessment, and institutional decision-making, drawn by genuine gains in efficiency, personalisation, and analytical capacity. Yet the same technologies that create educational opportunity also introduce substantial governance challenges around accountability, transparency, fairness, privacy, and academic integrity. These concerns carry particular weight in universities, whose obligations differ meaningfully from those of commercial organisations: institutions entrusted with educational development, knowledge creation, and public accountability face consequences when governance fails that extend well beyond operational inconvenience to matters of institutional legitimacy and educational equity.

The governance response to this challenge has been vigorous at the normative level. International standard-setting bodies have produced influential frameworks — the OECD Artificial Intelligence Principles, the UNESCO Recommendation on the Ethics of Artificial Intelligence, the NIST AI Risk Management Framework, and ISO/IEC 42001 — that collectively establish shared expectations around accountability, human oversight, transparency, and institutional responsibility. Within higher education specifically, a growing number of universities have introduced responsible AI policies, academic integrity guidance, and governance oversight mechanisms.

Despite these developments, a more fundamental governance problem persists. Many institutions publicly endorse responsible AI principles while simultaneously lacking the capability to operationalise them. Policies exist; governance committees are formed; ethical declarations are published. Yet the accountability structures, oversight mechanisms, coordination processes, and corrective capacities that would transform those commitments into effective practice often remain underdeveloped. The gap, in other words, is not between principles and values but between principles and preparedness.

This distinction matters because governance failures in AI deployment typically arise not from the absence of ethical intent but from the absence of institutional readiness. An institution may possess admirable governance aspirations while remaining unequipped to implement them when deployment actually occurs — a vulnerability that becomes acute in contexts characterised by resource constraints, evolving regulatory demands, and rapidly accelerating digital transformation agendas.

Existing frameworks address this problem only partially. Organisational readiness scholarship examines implementation capability but rarely focuses on governance legitimacy. Governance maturity models assess capability progression after structures exist rather than prerequisite conditions before deployment begins. Responsible AI frameworks specify normative expectations without attending systematically to whether institutions can meet them. The question that falls between these traditions — are institutions governance-ready before AI deployment occurs? — remains insufficiently explored.

This paper addresses that question through the concept of Ethical Readiness: the institutional governance condition in which accountability structures, governance ownership mechanisms, oversight capability, transparency preparedness, corrective governance capacity, governance adaptability, and governance proportionality are sufficiently developed to support responsible AI deployment. Rather than replacing existing responsible AI frameworks, Ethical Readiness functions as a complementary governance layer situated between ethical principles and operational deployment, focusing not on what institutions should do but on whether they are prepared to do it.

The paper contributes to the literature in four ways. First, it introduces Ethical Readiness as a distinct conceptual construct within responsible AI governance scholarship. Second, it differentiates this construct from adjacent concepts including governance maturity, organisational readiness, and responsible AI frameworks. Third, it operationalises the concept through a multidimensional governance architecture tailored to higher education. Fourth, it demonstrates practical relevance through comparative institutional evidence from contemporary university AI governance initiatives.

2. Literature Review

2.1 Responsible AI Governance

Responsible AI governance has evolved rapidly from a primarily philosophical concern into a multidisciplinary field encompassing public policy, organisational accountability, risk management, and technology regulation. The major international initiatives share several foundational assumptions: that institutions deploying AI must establish meaningful accountability mechanisms; that transparency and explainability are organisational as much as technical obligations; that governance structures must enable risk identification, mitigation, and corrective intervention; and that institutions remain responsible for the consequences of AI-supported decisions regardless of system sophistication.

Critical scholarship has usefully complicated this picture. Crawford (2021) and Mittelstadt et al. (2016) draw attention to structural power dynamics and algorithmic harm that normative principles may obscure. Selwyn (2019) raises questions about the implications of AI-driven systems for educational equity and professional autonomy. The EU Artificial Intelligence Act (European Parliament and of the Council, 2024) represents a significant regulatory development with direct implications for university governance across European systems; Veale and Borgesius (2021) provide an important analytical account of its governance implications.

What most of these frameworks share, however, is a focus on governance principles, objectives, or post-deployment outcomes rather than institutional preparedness prior to deployment. The question of whether institutions actually possess the governance capability to implement normative requirements — as opposed to merely committing to them — has received comparatively little systematic attention. This observation creates the analytical opening for Ethical Readiness as a governance-precondition construct.

2.2 Higher Education Governance and AI Adoption

Governance within universities differs from commercial governance in important structural respects. Universities operate within environments characterised by public accountability, academic autonomy, stakeholder diversity, and contested institutional legitimacy. Governance decisions affect not only operational outcomes but educational fairness, academic opportunity, student trust, and societal credibility. This environment, as Trow (1996) argued, demands governance mechanisms capable of preserving both accountability and academic values simultaneously.

The adoption of AI in higher education intensifies these demands. Universities now experiment with learning analytics, predictive student success models, AI-assisted assessment, intelligent tutoring systems, and administrative automation. Recent governance initiatives from institutions including the University of Edinburgh, Arizona State University, the University of Melbourne, and the National University of Singapore demonstrate growing recognition that effective AI governance requires institutional coordination rather than isolated technical controls. Nevertheless, approaches remain highly variable — some institutions emphasising policy development, others operational guidance, others awareness building — suggesting the absence of a consistent governance-preparedness framework.

2.3 Organisational Readiness and Governance Maturity

Weiner's (2009) theory of organisational readiness emphasises collective commitment and implementation capability as critical determinants of successful change; subsequent digital transformation research has similarly highlighted the importance of leadership support, coordination, and stakeholder engagement. These perspectives offer genuine insight into institutional preparedness but do not engage systematically with AI-specific governance obligations around accountability, oversight, and transparency. Institutional capacity frameworks — focused on operational capability, resource availability, and organisational resilience — share this limitation.

Governance maturity models such as COBIT provide mechanisms for assessing governance progression and benchmarking capability over time. Their limitation in the present context is temporal: they evaluate governance development after governance structures already exist rather than the governance conditions that must precede deployment. An institution may demonstrate mature governance in certain operational domains while remaining insufficiently prepared for AI-specific accountability and oversight challenges.

Ethical Readiness builds upon these traditions while maintaining a distinct analytical focus. The critical distinction is that readiness, in the present sense, is concerned with governance prerequisites — the conditions that must hold before deployment begins — rather than governance performance or capability progression after structures are established.

2.4 Research Gap

The reviewed literature demonstrates that existing frameworks address distinct and important governance concerns. Yet none directly focuses on institutional governance readiness as a prerequisite for responsible AI deployment. Responsible AI frameworks prioritise normative principles; organisational readiness models emphasise implementation capability; governance maturity approaches assess post-deployment progression; and higher education governance scholarship identifies institutional challenges without providing governance-precondition assessment tools. Table 1 summarises these distinctions.

Table 1. Governance Frameworks and Their Relationship to Pre-Deployment Readiness

Perspective	Primary Focus	Strength	Limitation
Responsible AI Governance	Ethical and governance principles	Normative guidance	Limited preparedness assessment

Organisational Readiness	Change implementation capability	Transformation support	Limited governance focus
Institutional Capacity	Organisational capability	Operational effectiveness	Limited AI governance emphasis
Governance Maturity	Governance optimisation	Capability assessment	Post-deployment orientation
Ethical Readiness	Governance preparedness before deployment	Governance-precondition evaluation	Requires empirical validation

3. Methodological Positioning

This study adopts a conceptual-theoretical research design aimed at developing and refining a governance framework for responsible AI deployment in higher education. Following Jaakkola's (2020) typology of conceptual article designs, the paper pursues a framework-building approach: its primary purpose is to introduce, define, and internally validate a new governance construct rather than test propositions against empirical data. This approach is consistent with the theory-building function identified by Gregor (2006), in which the construction and clarification of new explanatory frameworks constitutes a legitimate and distinct mode of scholarly contribution. Given the rapid evolution of AI governance practices and the limited availability of established governance-preparedness models for higher education, a conceptual-theoretical design is appropriate for the objectives of this study.

The Ethical Readiness framework was developed through integration of five scholarly domains: responsible AI governance literature provides foundational principles; higher education governance scholarship contributes perspectives on institutional legitimacy and accountability; organisational readiness research informs discussions of preparedness and institutional adaptation; governance maturity and institutional governance theories illuminate governance structures and capability development; and

institutional legitimacy theory — particularly the work of Suchman (1995), Meyer and Rowan (1977), and DiMaggio and Powell (1983) — provides the conceptual foundation for understanding why governance preparedness carries institutional significance beyond regulatory compliance.

Although the paper does not employ primary empirical data collection, it incorporates comparative institutional evidence derived from publicly documented AI governance initiatives implemented by universities across different educational and regulatory environments. These examples serve as analytical illustrations demonstrating how governance challenges identified in the literature are already being addressed through emerging institutional practices, thereby strengthening practical relevance while maintaining the conceptual orientation of the study.

Several important limitations follow from this design. The framework proposed here is a conceptual governance model rather than a validated measurement instrument. It does not claim universal applicability across all educational systems or regulatory environments, and the governance assumptions embedded within it draw primarily on Western and OECD-origin scholarship, a constraint that future empirical research should explicitly address. The eight governance dimensions are not asserted to be exhaustive, mutually exclusive, or universally applicable in identical form.

4. Conceptual Positioning of Ethical Readiness

Figure 1: Ethical Readiness as a Pre-Deployment Institutional Governance Layer

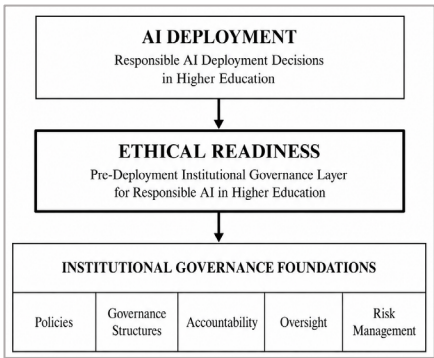


Figure 1 situates Ethical Readiness as a governance-precondition layer positioned between the external responsible AI governance ecosystem and the operational AI deployment environment. The positioning makes visible a governance transition zone that existing frameworks tend to overlook: not what institutions should do, but whether they are prepared to do it before AI systems become operationally embedded.

Ethical Readiness is defined as the institutional governance condition in which accountability structures, governance ownership mechanisms, oversight capability, transparency preparedness, corrective governance capacity, governance adaptability, and governance proportionality are sufficiently developed to support responsible AI deployment. This definition extends beyond policy compliance or ethical aspiration. An institution may publicly endorse responsible AI principles while remaining insufficiently prepared to implement them. Ethical Readiness is therefore concerned with institutional capability rather than institutional intention alone.

The concept rests on five foundational propositions: responsible AI governance requires institutional preparedness as a prior condition; governance capability is analytically distinct from governance intention; accountability mechanisms must be operationalised before deployment rather than retrofitted after problems emerge; governance intensity should vary proportionally with institutional context and risk exposure; and governance legitimacy depends upon both governance design and the readiness to execute that design.

Table 2 places Ethical Readiness in explicit comparative relation to existing governance models. The comparison reveals that Ethical Readiness does not displace these frameworks but occupies a governance-preparedness space that each leaves underdeveloped: governance maturity models focus on optimisation and progression; organisational readiness frameworks examine implementation capability; responsible AI frameworks establish normative expectations. Ethical Readiness differs by attending specifically to the governance conditions required before deployment occurs.

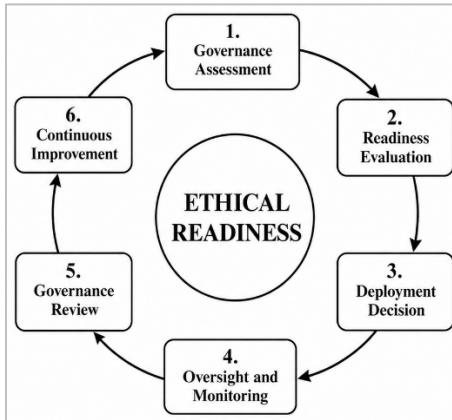
Table 2. Ethical Readiness Compared with Existing Governance Models

Governance Feature	Ethical Readiness	Governance Maturity	Org. Readiness	Responsible AI Frameworks
Pre-deployment focus	✓	✗	Partial	✗
Governance legitimacy	✓	Limited	Limited	Partial
Accountability mapping	✓	Partial	Partial	Partial
Governance proportionality	✓	✗	✗	Limited
Educational context sensitivity	✓	✗	✗	✗
Transparency readiness	✓	Partial	Limited	✓
Corrective governance capacity	✓	Limited	Limited	Partial
Oversight preparedness	✓	Partial	Partial	Partial

From this positioning, governance effectiveness depends upon three interdependent layers: governance principles specifying what institutions should do; governance readiness establishing whether institutions are prepared to do it; and governance execution determining how requirements are operationalised in practice. Ethical Readiness addresses the second of these layers — the layer most consistently absent from existing scholarship.

5. Ethical Readiness Dimensions

Figure 3: Ethical Readiness Dimensions Framework



The Ethical Readiness framework is operationalised through eight interdependent governance dimensions. These dimensions should be understood as interconnected governance capabilities rather than discrete controls: weakness in any single dimension reduces overall governance effectiveness even when other elements appear robust. The following discussion organises the dimensions into three analytical groupings, but this structure is analytical rather than hierarchical — all dimensions are operationally interdependent.

5.1 Governance Structure Dimensions

The most foundational governance requirements for responsible AI deployment concern the clarity of institutional rules, roles, and accountabilities. Without these structural prerequisites, more sophisticated governance mechanisms cannot function effectively.

Normative Clarity refers to the degree to which an institution has established clear expectations regarding acceptable and unacceptable AI-related practices. It functions as the common governance reference point from which decision-making, accountability, and institutional behaviour proceed. Its

absence is particularly consequential in higher education, where AI applications touch on academic assessment, data use, research integrity, and student rights: without shared normative expectations, inconsistency across faculties, departments, and administrative units becomes the default condition.

Role Clarity concerns the allocation of governance responsibilities, accountability ownership, oversight duties, and decision-making authority across institutional stakeholders. This dimension is especially challenging in universities because AI governance necessarily involves faculty members, administrators, technology teams, ethics committees, legal advisors, and institutional leadership simultaneously. When these roles overlap or remain unspecified, governance coordination degrades — not through bad intent but through structural ambiguity. Accountability Mapping extends this logic to traceability: it involves the explicit identification and documentation of governance ownership across the AI deployment lifecycle, from procurement and implementation through monitoring, review, escalation, and corrective intervention. Together, normative clarity, role clarity, and accountability mapping establish the governance architecture without which oversight and transparency obligations cannot be discharged.

5.2 Governance Control Dimensions

Where structural dimensions establish governance architecture, control dimensions enable active governance performance throughout the deployment lifecycle.

Oversight Capacity refers to the institutional ability to monitor, review, evaluate, and supervise AI-enabled activities. Oversight mechanisms provide governance visibility, enabling institutions to identify emerging concerns before they become operational failures. In higher education contexts — where AI is applied to assessment outcomes, student profiling, and academic progression — governance blind spots generated by inadequate oversight can carry direct educational consequences. The distinction between oversight as a formal commitment and oversight as a functioning capability is precisely the gap that Ethical Readiness targets.

Corrective Governance Capacity addresses what happens when oversight reveals problems. Many governance discussions focus on detection; Ethical Readiness insists equally on remediation. The capability to intervene — to suspend, review, investigate, remediate, and adapt when governance deficiencies are identified — is distinct from the capability to detect. Institutions may possess monitoring structures while lacking the authority, procedures, and coordination capacity to act on what monitoring reveals. Without corrective capacity, governance collapses into audit theatre.

5.3 Governance Adaptation Dimensions

The third grouping addresses the quality of governance judgement and the capacity of governance structures to evolve as technological, regulatory, and institutional environments change.

Contextual Judgement refers to the ability to calibrate governance intensity in proportion to institutional context, educational sensitivity, and risk exposure. Not all AI applications require identical governance interventions: assessment systems affecting academic progression demand substantially stronger accountability structures and transparency safeguards than scheduling automation. Uniform governance approaches either over-regulate low-risk deployments or, more dangerously, apply the same light-touch governance to high-stakes contexts as to routine administrative tools. Contextual judgement is what allows institutions to deploy governance resources where they create most value.

Transparency Readiness concerns institutional preparedness for governance disclosure, stakeholder communication, explainability, and decision visibility. Within universities, expectations of transparency extend from students seeking to understand how AI influences their academic assessment, to faculty members whose professional judgements may be mediated or supplemented by algorithmic systems, to regulators assessing institutional compliance with emerging AI legislation. Transparency readiness is not simply a commitment to disclosure — it requires the governance infrastructure through which disclosure becomes operationally possible.

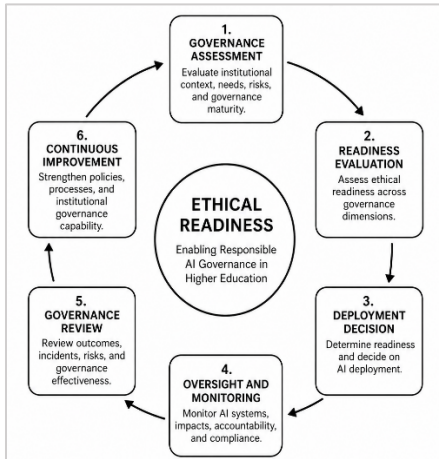
Governance Adaptability, finally, refers to the capacity of governance structures to evolve in response to technological change, shifting regulatory requirements, and emerging educational challenges. As generative AI continues to evolve, governance frameworks designed for earlier AI generations will require revision. Institutions that cannot adapt their governance — updating normative expectations, reallocating accountability, revising oversight arrangements — will progressively accumulate governance debt as deployed technologies outpace governance structures. Table 3 summarises all eight dimensions.

Table 3. Summary of Ethical Readiness Dimensions

Dimension	Governance Group	Primary Function	Risk if Weak
Normative Clarity	Structure	Establish governance expectations	Inconsistent institutional behaviour
Role Clarity	Structure	Allocate accountability	Responsibility diffusion
Accountability Mapping	Structure	Ensure lifecycle traceability	Accountability gaps
Oversight Capacity	Control	Enable governance visibility	Governance blind spots
Corrective Governance Capacity	Control	Enable intervention and remediation	Governance stagnation
Contextual Judgement	Adaptation	Support governance proportionality	Governance misalignment
Transparency Readiness	Adaptation	Strengthen trust and legitimacy	Stakeholder distrust
Governance Adaptability	Adaptation	Support continuous evolution	Governance obsolescence

6. The Ethical Readiness Governance Lifecycle

Figure 2: *Ethical Readiness Governance Lifecycle Model*



Ethical Readiness is not a threshold condition achieved at a single moment but a dynamic institutional capability that must be actively maintained across the full AI deployment lifecycle. Figure 2 presents a seven-stage model that clarifies how governance preparedness develops and operates over time.

The lifecycle divides analytically into two phases. Stages 1 through 3 constitute the pre-deployment readiness phase — the primary domain of the Ethical Readiness framework — addressing the governance conditions that must be established before AI systems become operationally embedded. Stages 4 through 7 represent governance-enabled operational activity, in which deployment proceeds within the accountability structures and oversight mechanisms established during the readiness phase. This distinction matters: Ethical Readiness does not govern deployment performance as such but establishes the architecture that makes responsible deployment possible.

The pre-deployment phase begins with Institutional Awareness: the recognition, at leadership and governance levels, that AI adoption introduces governance implications extending beyond technology implementation. Awareness is foundational because governance cannot address risks that have

not been recognised. This is followed by Governance Assessment, in which institutions examine existing governance structures against the eight Ethical Readiness dimensions, identifying capability strengths, weaknesses, and gaps before deployment occurs rather than after failures emerge. The third stage, Governance Structuring, transforms awareness and assessment into governance architecture: formalising accountability assignments, establishing oversight responsibilities, creating escalation pathways, and developing transparency expectations in ways that are traceable and enforceable.

The operational phase begins with Controlled AI Deployment: implementation under governance supervision, with continuous attention to accountability and oversight obligations. Stage 5, Monitoring and Oversight, sustains governance visibility throughout deployment — providing the information necessary for both correction and adaptation. Stage 6, Corrective Governance Intervention, addresses identified deficiencies through suspension, review, investigation, or remediation. The final stage, Institutional Learning, closes the loop: governance experience informs revisions to normative expectations, role allocations, oversight arrangements, and governance structures, strengthening preparedness for subsequent deployments. Table 4 summarises the lifecycle.

Table 4. Ethical Readiness Governance Lifecycle: Stages, Objectives, and Governance Functions

Stage	Phase	Governance Objective	Core Function
1. Institutional Awareness	Pre-deployment	Recognise governance obligations	Foundation for preparedness
2. Governance Assessment	Pre-deployment	Evaluate current readiness against dimensions	Gap identification
3. Governance Structuring	Pre-deployment	Establish governance architecture	Accountability and oversight design

4. Controlled Deployment	Operational	Deploy within governance boundaries	Governance-enabled implementation
5. Monitoring and Oversight	Operational	Maintain governance visibility	Continuous performance review
6. Corrective Intervention	Operational	Address identified deficiencies	Remediation and escalation
7. Institutional Learning	Operational	Adapt governance from experience	Continuous governance improvement

7. Institutional Governance Applications

The practical significance of Ethical Readiness is most visible when the framework is applied to specific AI deployment contexts. Different AI applications within universities generate substantially different governance demands, and the principle of governance proportionality — that governance intensity should be calibrated to educational sensitivity, accountability exposure, and risk severity — is one of the framework's most operationally important features.

7.1 AI-Assisted Assessment and Predictive Student Analytics

Assessment systems that incorporate AI to support grading, feedback generation, or academic progression decisions represent the most governance-sensitive deployment category within higher education. Their consequences extend directly to student outcomes and institutional credibility, making failures in accountability, transparency, or oversight particularly consequential. The governance requirements are correspondingly demanding: the highest levels of normative clarity, accountability mapping, transparency readiness, and oversight capacity are necessary to ensure that algorithmic influence on educational decisions remains explainable, traceable, and subject to meaningful human review. Institutions including the University of Melbourne and a number of UK universities have introduced AI assessment governance policies, disclosure requirements, and human review obligations that reflect this governance sensitivity in practice.

Predictive analytics systems — deployed to identify students at risk of underperformance, disengagement, or withdrawal — introduce related but distinct governance challenges. The potential benefits of proactive intervention are real; so are the risks of opaque profiling, algorithmic bias, and inadequate explainability. The governance question is not whether such systems should be used but whether institutions can implement them responsibly. Contextual judgement is particularly critical here, as are transparency readiness and accountability mapping: students whose academic trajectories are influenced by predictive models have legitimate interests in understanding the governance conditions under which those models operate.

7.2 Student Monitoring and Administrative Automation

Behavioural monitoring technologies — remote proctoring, engagement tracking, attendance monitoring, and activity surveillance — represent the AI deployment category most directly implicated in questions of educational trust and institutional legitimacy. The governance concerns are fundamental: privacy, autonomy, and the relationship between surveillance and educational environment. These applications require the highest levels of transparency readiness and corrective governance capacity, not only because of their intrinsic governance sensitivity but because the consequences of deploying them without adequate governance preparation extend to student trust and institutional reputation. The University of Edinburgh's generative AI guidance and comparable transparency frameworks from other institutions suggest growing awareness that student-facing AI applications require governance infrastructure before deployment rather than retrospective justification.

Administrative AI automation — chatbots, scheduling support, resource allocation assistance, service management — presents a genuinely different governance profile. Its educational consequences are generally lower, and governance requirements are correspondingly less intensive. Yet the principle of governance proportionality should not be read as governance permissiveness: role clarity and governance adaptability remain important even in lower-risk deployments, particularly given the tendency of

administrative automation to expand in scope over time. The distinction between these two application categories illustrates why uniform governance approaches are inadequate: the governance structures appropriate for proctoring systems would be disproportionate for scheduling tools and insufficient for assessment systems.

7.3 Generative AI Research Assistance

The rapid diffusion of generative AI tools into academic research workflows creates governance challenges that are both novel and institution-wide. Questions of authorship, attribution, intellectual ownership, and research integrity resist straightforward resolution, and normative expectations are still forming across the sector. What the Ethical Readiness framework highlights is that this uncertainty itself constitutes a governance risk: institutions that deploy generative AI research tools without first establishing normative clarity and accountability mapping are exposed to integrity challenges they will struggle to address retrospectively. Recent guidance from the University of Edinburgh and comparable international institutions has begun to establish disclosure obligations and attribution expectations, but governance adaptability will remain critical as both the capabilities of generative AI tools and the scholarly community's responses to them continue to evolve.

7.4 Governance Intensity Across Deployment Contexts

Table 5 consolidates the comparative governance analysis across the five application domains, illustrating how Ethical Readiness requirements should be calibrated to deployment context. The assessment is indicative rather than prescriptive: it is intended to support institutional governance reflection rather than replace contextual judgement.

Table 5. Governance Intensity and Ethical Readiness Requirements by Deployment Context

AI Application	Governance Sensitivity	Critical Dimensions	Ethical Readiness Requirement
AI-Assisted Assessment	Very High	Accountability Mapping, Transparency Readiness, Oversight Capacity	Very High
Student Monitoring / Proctoring	Very High	Transparency Readiness, Corrective Capacity, Contextual Judgement	Very High
Predictive Student Analytics	High	Contextual Judgement, Accountability Mapping, Transparency Readiness	High
Generative AI Research Assistance	Medium-High	Normative Clarity, Governance Adaptability, Accountability Mapping	High
Administrative AI Automation	Medium	Role Clarity, Governance Adaptability, Oversight Capacity	Moderate

Several patterns emerge from this comparative analysis that reinforce the framework's theoretical claims. First, governance requirements are genuinely heterogeneous across deployment types: the governance architecture appropriate for one application would be disproportionate or insufficient for another. Second, accountability mapping and transparency readiness appear as critical dimensions across multiple high-sensitivity contexts, suggesting they function as foundational governance capabilities rather than context-specific requirements. Third, the institutions whose governance initiatives are

referenced — Edinburgh, Melbourne, Arizona State, the National University of Singapore — have each developed governance mechanisms that implicitly address the Ethical Readiness dimensions most salient to their deployment priorities, offering preliminary institutional evidence that the framework reflects real governance dynamics rather than purely theoretical concerns.

8. Discussion

8.1 Governance Preparedness as a Prerequisite, not a Consequence

The central implication of this study is the reframing of governance capability as a prerequisite for responsible AI deployment rather than a consequence of operational experience. This distinction is less intuitive than it might appear. Much contemporary AI governance discourse — including many institutional policy documents — implicitly assumes that governance structures develop through iterative deployment: organisations deploy, encounter problems, and respond by strengthening governance. There is a genuine argument for this approach in domains where risks are modest and learning costs are manageable. In higher education, where AI applications can directly influence student outcomes, academic progression, and institutional legitimacy, the costs of retrospective governance development are substantially higher.

The Ethical Readiness framework operationalises this argument by specifying the governance conditions that must hold before deployment rather than merely documenting what governance should look like in theory. Institutions may possess policies, ethical guidelines, governance committees, and compliance obligations while simultaneously lacking the preparedness to implement those mechanisms effectively. Recognising this gap — and measuring it through the eight dimensions — is the framework's primary practical contribution.

8.2 Governance Proportionality and Institutional Context

A second contribution concerns the principle of governance proportionality. Universities are not governance monoliths: their AI deployments differ in

educational sensitivity, stakeholder exposure, regulatory relevance, and corrective consequence. A governance framework that imposes identical requirements across assessment systems and scheduling automation misallocates governance resources while potentially under-governing the applications that most warrant scrutiny. The comparative analysis in Section 7 demonstrates that governance requirements vary substantially and systematically across deployment contexts, and that institutions can benefit from frameworks that make this variation explicit and actionable.

This principle has practical implications for how governance committees are structured and resourced. Rather than applying uniform review processes to all AI deployments, institutions would benefit from governance triage mechanisms that allocate oversight intensity in proportion to deployment sensitivity. This is not a counsel for governance minimalism but for governance efficiency — ensuring that the highest-risk deployments receive governance attention commensurate with their stakes.

8.3 Theoretical Contributions

The study contributes to responsible AI governance scholarship through four analytical moves. First, it introduces governance preparedness as a distinct object of analysis, separable from governance principles, governance compliance, and governance maturity. This expansion of the analytical scope of responsible AI governance research opens space for empirical investigation into institutional readiness conditions that existing frameworks assume rather than examine.

Second, the framework integrates theoretical traditions that have developed largely in parallel — responsible AI governance, higher education governance, organisational readiness, governance maturity, and institutional legitimacy theory — into a unified governance-precondition architecture. This integration provides conceptual resources that no single tradition could supply: institutional legitimacy theory (Suchman, 1995; Meyer and Rowan, 1977) explains why governance preparedness carries significance beyond regulatory compliance; organisational readiness scholarship (Weiner, 2009)

informs the lifecycle model; accountability theory (Bovens, 2007) grounds the accountability mapping and corrective capacity dimensions.

Third, the framework operationalises governance preparedness through identifiable dimensions that can support institutional assessment and, importantly, future empirical investigation. Fourth, by situating the framework specifically within higher education, the study addresses governance concerns — educational accountability, academic integrity, student trust, institutional legitimacy — that sector-neutral frameworks necessarily abstract away.

8.4 Limitations, Tensions, and Critiques

Several limitations require candid acknowledgement. The framework remains conceptual and has not undergone systematic empirical validation. The comparative institutional evidence serves as analytical illustration rather than formal case study analysis. The governance assumptions embedded in the framework draw primarily on Western and OECD-origin scholarship, and their applicability across non-Western higher education systems, resource-constrained institutional contexts, and diverse regulatory environments requires explicit empirical investigation.

The eight dimensions are not claimed to be exhaustive or mutually exclusive, and the governance intensity assessments in Table 5 are indicative heuristics derived from governance logic rather than measured empirical findings. They should be treated as starting points for institutional reflection rather than conclusions. There is also a genuine risk that Ethical Readiness could be adopted performatively — as a compliance exercise or governance checklist — rather than as a substantive institutional capability. Addressing this risk requires empirical research into how institutions actually engage with governance-readiness frameworks in practice, rather than how they report engaging with them.

Three alternative interpretations deserve acknowledgement. Some scholars may argue that existing responsible AI frameworks already address institutional preparedness through their accountability and transparency provisions. This critique has some force: the distance between the present

framework and existing approaches is one of analytical emphasis rather than categorical difference. The response is that analytical emphasis matters — frameworks that foreground governance principles without attending to governance prerequisites produce different institutional behaviours than frameworks that treat preparedness as a first-order concern. A second critique might read Ethical Readiness as organisational readiness theory applied to AI governance, without substantive novelty. The response here is that the governance-specific dimensions — accountability mapping, corrective capacity, transparency readiness — represent adaptations that existing readiness frameworks do not supply. A third critique concerns governance burden: governance-intensive frameworks may slow innovation or create administrative complexity disproportionate to their benefits. The proportionality principle in the framework is a direct response to this concern, but the tension between governance rigour and institutional agility remains genuine and context-dependent.

9. Conclusion

Artificial intelligence is becoming structurally embedded within the operational, academic, and strategic functions of higher education institutions. The governance frameworks that have emerged in response — international principles, national regulations, institutional policies — represent genuine progress. They have clarified normative expectations, focused regulatory attention, and raised institutional awareness of the obligations associated with AI deployment.

What these frameworks have addressed less systematically is the question of whether institutions are actually prepared to govern before deployment occurs. This paper has argued that the gap between responsible AI commitments and responsible AI practice is often a gap of governance preparedness: not a failure of intention but a failure of readiness. Institutions may possess policies, committees, and ethical declarations while lacking the accountability structures, oversight mechanisms, corrective capacities, and adaptive governance capabilities that would allow those commitments to function in practice.

Ethical Readiness was introduced as a governance-precondition framework for addressing this gap within higher education. Defined as the institutional governance condition in which accountability structures, governance ownership mechanisms, oversight capability, transparency preparedness, corrective governance capacity, governance adaptability, and governance proportionality are sufficiently developed to support responsible AI deployment, the framework operationalises governance preparedness through eight interdependent dimensions and a seven-stage lifecycle model. Its applicability across assessment systems, predictive analytics, behavioural monitoring, generative AI tools, and administrative automation was examined through comparative institutional evidence, illustrating both the heterogeneity of governance requirements and the underlying governance capabilities that recur across high-sensitivity contexts.

Three directions for future research follow from this work. The most urgent priority is empirical validation through institutional case studies: qualitative research examining how governance structures, accountability mechanisms, and oversight capabilities develop in practice prior to AI deployment, with attention to variation across institutional types, national regulatory environments, and resource levels. Second, the development of a validated Ethical Readiness assessment instrument — capable of measuring institutional governance preparedness across the eight dimensions through survey methods, expert panel assessment, or document analysis — would operationalise the framework in ways that enable comparative institutional research and longitudinal tracking of governance development. Third, future research should examine whether institutions with higher pre-deployment governance preparedness demonstrate more accountable, transparent, and correctively responsive deployment behaviour — moving Ethical Readiness from a descriptive framework to a predictive governance model with direct policy implications.

Universities that deploy AI without adequate governance preparation carry a distinctive kind of institutional risk. It is not only the risk of algorithmic failure or regulatory non-compliance, but of deploying consequential technologies in environments where the governance conditions for responsible oversight do not yet exist. Ethical Readiness is proposed as a

framework for understanding, assessing, and strengthening those conditions. Ultimately, responsible AI deployment requires institutions that are not merely committed to responsible governance but prepared to execute it.

Use of Generative Artificial Intelligence

Generative AI tools were used during the preparation of this manuscript to provide language refinement, editorial assistance, brainstorming support, and structural formatting assistance. The author retained full intellectual responsibility for all aspects of the work, including conceptual development, literature review and synthesis, framework design, analytical argumentation, interpretation of evidence, and the conclusions drawn. All substantive scholarly content, theoretical claims, and research contributions are the author's own. The use of AI tools for language and formatting assistance does not affect the originality, integrity, or intellectual ownership of the research presented here. This disclosure is provided in accordance with academic publishing standards for transparency in AI-assisted scholarly work.

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11. Short biography

Mohamed Hussien Abdelaziz is an AI governance and institutional transformation specialist working at the intersection of artificial intelligence, governance, ethics, and higher education futures. His work focuses on responsible AI deployment, institutional accountability, and the governance of digitally transforming organisations in regulated and emerging contexts. He holds a Ph.D. in AI/NLP and is particularly interested in how AI reshapes epistemic environments, legitimacy, and decision-making across complex institutional settings.

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Article 24 of UNCRPD and Its Influences on Legal, Policy, and Strategic Frameworks for Inclusive Education in Tanzania

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Keywords

Accommodation, discrimination, disability, inclusive education

Abstract

The right to an inclusive education is covered in the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) in Article 24 on Education. This study analysed UNCRPD's Article 24 and its influence on Tanzania's legal, policy and strategic framework. The study used a narrative qualitative research approach with a focus on documentary review. Using thematic content analysis, five major themes were deductively established: (i) organisation of Article 24 of UNCRPD on education, (ii) obligations of inclusive education, (iii) goals of inclusive education, (iv) principles of inclusive education, and (v) Tanzania's integration of Article 24 of the UNCRPD. There were also inductive sub-themes related to Tanzania's integration of Article 24 of the UNCRPD related to legal, policy, and strategic frameworks as well as achievements and challenges. The findings underscore the significant role of Article 24 in shaping Tanzania's inclusive education agenda while also highlighting persistent challenges that must be addressed to achieve equitable and disability-inclusive education.

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1. Introduction

The adoption of inclusive education systems has gained momentum, which is reinforced by policy and strategic frameworks in many countries. As stated by UNESCO (2009), the “concept and practice of inclusive education have gained importance in recent years. Internationally, the term is increasingly understood more broadly as a reform that supports and welcomes diversity amongst all learners” (p. 4). Every child has the right to realize their potential and get a high-quality education. For children with disabilities (CWDs) to get the best education, countries need to make commitments to provide inclusive education. As stated by the Committee on the Rights of Persons with Disabilities (CRPD), it is “only inclusive education [that] can provide both quality education and social development for persons with disabilities and a guarantee of universality and non-discrimination in the right to education.” (CRPD, 2016, p. 1). As outlined by CRPD (2016), inclusive education is:

- “ (a) a fundamental human right of all learners...; (b) a principle that values the well-being of all [children], respects their inherent dignity and autonomy, and acknowledges individuals’ requirements and their ability to effectively be included in and contribute to society; (c) a means of realizing other human rights... the primary means by which persons with disabilities can lift themselves out of poverty,... means to participate fully in their communities and be safeguarded from exploitation..., means of achieving inclusive societies; (d) the result of a process of continuing and proactive commitment to eliminating barriers impeding the right to education, together with changes to culture, policy and practice of regular schools to accommodate and effectively include all [children] (p. 3).

The UN Convention on the Rights of Persons with Disabilities (UNCRPD), which was put into effect in 2008, is the primary tool for improving the human rights of people with disabilities. The Convention was adopted in many African governments during a time when discrimination and marginalization of people with disabilities were pervasive (Dziva et al., 2018).

The Convention has been praised as a turning point in the fight to redefine the interests and concerns of people with disabilities. It seeks to maintain the intrinsic dignity of all people with disabilities and to guarantee that they can fully and equally enjoy all human rights and basic freedoms (UN, 2006). Individuals with disabilities may have chronic physical, mental, intellectual, or sensory impairments that, when combined with additional obstacles, may prevent them from fully and equally participating in society or social activities including education. The Convention requires the nations to take all necessary steps to guarantee that CWDs have equal access to and enjoyment of all basic freedoms and human rights, just like other children (UN, 2006).

As observed by Dziva et al. (2018), UNCRPD confirms to a paradigm change away from considering people with disabilities as charity cases and toward considering them as human rights holders and collaborators in the pursuit of sustainable development. Importantly, UNCRPD essentially serves as both a development and a human rights protection tool. The preamble of UNCRPD, which emphasizes that people with disabilities shall fully enjoy all human rights and basic freedoms on an equal footing with others, reiterates UNCRPD's role in promoting human rights (UN, 2006).

The convention is appreciated to be the first treaty that offers an integrated approach to the protection and promotion of about 15 percent of people worldwide who live with various types of disability (WHO & World Bank 2011). As a result, UNCRPD is a thorough and well-considered framework with provisions designed to address the primary issues faced by people with disabilities (Dziva et al., 2018). UNCRPD consists of several constituent parts. Articles 1 through 9 of UNCRPD's introduction define terminology and outline the Convention's goals. A detailed explanation of people with disabilities' rights to specific political, social, economic, and cultural rights may be found in articles 10 through 30. The implementation and monitoring methods are in articles 31–40. Articles 41–50 of the Convention, which control how UNCRPD functions, come to an end.

A major turning point is marked by Article 24 of UNCRPD on education, which expressly acknowledges children with disabilities' right to inclusive education at all levels. It requires member states to guarantee a free, high-quality, and inclusive education system in which students with disabilities are not kept out of the general education system because of their condition. In

Article 24 of the UNCRPD, disability is seen through the lens of the social model, which places more emphasis on environmental and societal impediments than on personal limitations. This represents a paradigm change towards the push for accessibility, non-discrimination, equity in education, and reasonable accommodations in educational systems. The article safeguards the right to quality education for all CWDs. It declares that all children have the right to inclusive education and outlines the necessary actions to achieve this goal. All CWDs must not only face discrimination but also be allowed to take part in the general school. In many nations, including Tanzania, this international commitment has influenced legislative changes and educational practices.

The contexts of international human rights law, Tanzania's national education policy, and changing disability paradigms provide a basis for arguing how inclusive education has been framed and pursued. However, assessment of the UNCRPD's Article 24 and its impacts on disability inclusion in many countries, Tanzania in particular, has received minimal scholarly attention. Therefore, the purpose of this study is to critically examine the key obligations, goals and principles of inclusive education outlined in Article 24 of the UNCRPD and how well they have been implanted in Tanzania's inclusive education framework. Specifically, this study answers the following question:

- How is Article 24 of the UNCRPD on education organised?
- What are the key obligations, goals, and principles of inclusive education outlined in Article 24 of the UNCRPD?
- How has Article 24 of the UNCRPD been integrated into Tanzania's national education legal, policy, and strategic frameworks?

From theoretical point of view, the social model of disability and rights-based educational theory serve as the foundation for this study. The social model of disability that prevent full participation, rather than personal limitations. Simultaneously, the rights-based approach to education makes the case that access to inclusive education is a legal and moral requirement rather than a question of charity or policy preference by citing international human rights law, especially UNCRPD. With the rights-based approach, states are required

to uphold, defend, and fulfil the right to inclusive education. Furthermore, policy transfer theory provides a framework for exploring the adoption and adaptation of international legal norms, such as those found in Article 24 of UNCRPD, inside national policy contexts. It takes into account both the advantages and disadvantages of implementing international standards in regional contexts.

2. Methodology

Research approach and design

This study used a narrative qualitative research approach with a focus on documentary review. The choice of research approach was informed by the nature of the study, which aimed to analyse how Article 24 of the UNCRPD has influenced Tanzania's legal, policy, and strategic frameworks for disability-inclusive education. Therefore, the best method was a desk-based study of documents because the analysis required knowledge of legal, policy, and strategic frameworks.

Location of the study

Although the study was a desk-based review, the context of analysis was Tanzania, with specific attention to national legal, policy, and strategic documents echoing disability-inclusive education. The review was within the Tanzanian education sector, with documents accessed from official repositories such as online databases of the Ministry of Education, Science and Technology (MoEST).

Sources of Data

In this study, secondary data were collected. Data were generated from the analysis of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), especially Article 24 as the international normative framework, and the national legal, policy, and strategy documents, such as:

- Tanzania's Persons with Disabilities Act No. 9 of 2010.
- Tanzania's Law of the Child Act of 2009, revised edition of 2019.

- Tanzania's Education and Training Policy 2014, Edition 2023.
- Tanzania's National strategies for inclusive education (NSIE), namely, NSIE (2009–17), NSIE (2018–21), and the current NSIE (2021/22–2025/26).

Data Analysis

The analysis employed a legal, policy, and strategy analysis framework to explore how UNCRPD's Article 24 has influenced disability-inclusive education in Tanzania by classifying data sources into three domains. This involved (i) the analysis of the UNCRPD's Article 24 as the global normative framework; (ii) the analysis of Tanzania's national inclusive education legislation, policy, and strategies; and (iii) the analysis of how closely Tanzania's frameworks conform to its commitments under Article 24 of the UNCRPD. Data were analysed using thematic content analysis. The steps of analysis included the selection of relevant documents, coding, comparison, and synthesis of findings. Initially, relevant international (Article 24 of UNCRPD) and national documents (Tanzania's legal, policy, and NSIE documents) were identified and analysed.

In coding, the provisions of Article 24 were broken into key thematic areas: organisation of Article 24 of UNCRPD on education and obligations, goals, and principles of inclusive education. Subthemes in principles of inclusive education included non-discrimination, reasonable accommodation, personalised adequate support, safe and inclusive environments, effective communication and accessibility, continuous professional development, and access to lifelong learning. These themes were then compared with Tanzania's legal, policy, and NSIE documents to determine areas of alignment or partial compliance. This was important to determine the themes related to the established legal, policy, and strategic frameworks that promote disability-inclusive education and achievements and challenges. Lastly, the synthesis was important to broadly organise the findings to highlight the influence of Article 24 on Tanzania's inclusive education strategies over time.

Ethical issues

In this study, there were no human participants because it only used secondary data (international treaty, legal, strategic, and policy documents). The following were among the ethical factors: accurate portrayal of every aspect of the documentary content; proper source acknowledgement and citation in order to prevent plagiarism; and transparency and objectivity in document analysis, preventing misinterpretations of legal provisions.

3. Findings

This part presents five key themes that were deductively established after analysis of international (Article 24 of UNCRPD) and national documents (Tanzania’s legal, policy, and NSIE documents): (i) organisation of Article 24 of UNCRPD on education, (ii) obligations of inclusive education, (iii) goals of inclusive education, (iv) principles of inclusive education, and (v) Tanzania’s integration of Article 24 of the UNCRPD. The inductive sub-themes in principles of inclusive education are also presented in this part: non-discrimination, reasonable accommodation, personalised adequate support, safe and inclusive environments, effective communication and accessibility, continuous professional development, and access to lifelong learning. There were also inductive sub-themes related to Tanzania’s integration of Article 24 of the UNCRPD (legal, policy, and strategic frameworks and achievements and challenges).

Organization of Article 24 of UNCRPD on the education

Article 24 of the UNCRPD is organized into five parts. Part of Article 24 outlines the goals of an inclusive education. These goals include: (a) developing and maximizing human potential and promoting self-worth, respect, and dignity; (b) enhancing respect for diversity, fundamental freedoms, and human rights; (c) helping people with disabilities reach their full potential in terms of personality, talents, and creativity; and (d) enabling persons with disabilities to participate effectively in society (Article 24 [1]). Part two is on exclusion and discrimination. Among the Article’s 24 provisions are the following: (a) prohibiting the rejection of individuals with disabilities from free and compulsory general education; (b) requiring nations

to guarantee that equal access to inclusive, high-quality free education should be available for people with disabilities; and (c) requiring nations to offer specialized assistance and appropriate adjustments for achieving the goal of full participation (Article 24 [2]).

Part three of Article 24 of the UNCRPD addresses suitable measures to facilitate CWDs to fully and equally participate in education and the necessary steps that should be taken, including the acquisition of Braille and sign language (Article 24 [3]). Part four of the article focuses on the training and hiring of qualified and knowledgeable teachers in sign language and/or Braille who can work at all educational levels (Article 24 [4]). Part five of the article lays out the countries' obligations to guarantee that CWDs can access general education, including postsecondary education, adult education, vocational training, and lifelong learning. This part also adheres to the non-discrimination principle and the treatment of people with disabilities equally with other people (Article 24 [5]).

Obligations of inclusive education

One of the credits that can be attached to UNCRPD is its emphasis on inclusive education for all. As stated in UNCRPD's Article 24(1), nations must guarantee the provision of inclusive education and lifelong learning for all. In this clause, special education is the exception and inclusive education is the rule. Article 24(2)(a) and (b) of the UNCRPD states that nations must make sure that CWDs have equal opportunity to access inclusive education at all educational levels without discrimination based on their disability. CWDs must not be excluded from basic and compulsory education. Consequently, CWDs must be encouraged to attend conventional schools in their neighbourhood. CWDs must not be restricted from access to a high-quality inclusive education due to their condition. In short, UNCRPD in Article 24(2) enhances inclusive education for all.

Goals of inclusive education

It is significant to note that UNCRPD's Article 24 clearly outlines the goals of inclusive education. It is stated in UNCRPD Article 24(1) that nations must guarantee inclusive education and lifelong learning at all educational levels. The goals of inclusive education should be to (a) develop and foster human

potential and promote self-worth, respect, and dignity; (b) enhance respect for diversity, fundamental freedoms, and human rights; (c) help people with disabilities reach their full potential in terms of personality, talents, and creativity; and (d) enable people with disabilities to engage fully in society. Therefore, it may be argued that these goals should be implemented in every educational system to make inclusive education practical.

Principles of inclusive education

Sub-theme in this themes which are important to the development of disability-inclusive education included: non-discrimination, reasonable accommodation, adequate support, learning and teaching environment, effective communication, qualified teachers, professional training, and lifelong learning.

Non-discrimination

Article 2 of UNCRPD states that disability discrimination means any kind of difference, exclusion, or limitation that precludes people with disabilities from equally utilizing or putting their human rights into practice in all areas of life. Article 24(2)(a) guarantees CWDs equitable access to quality inclusive education in mainstream schools without discrimination. To this clause, no student's impairment may be a reason for their exclusion from free and required general education. This provision is important as it reminds the countries to openly state a ‘no-rejection clause’ in their educational policies and laws. Legislation that openly rejects students with disabilities from receiving an education because of a disability must be revised. It underscores that countries must prohibit the denial of admission of CWDs into inclusive schools and guarantee continuity in education. This necessitates reasonable accommodation and adequate support to enhance quality disability-inclusive education for all students in schools.

These principles are in line with the legislative framework in Tanzania, including the Education Act; National Education and Training Policy, 2014, Edition 2023; National Strategy for Inclusive Education; and Persons with Disabilities Act No. 9 of 2010. The above-mentioned documents promote equality in education. However, according to research carried out by MlOLELE et al. (2023), Philip (2024), Mohammed and Almasi (2024), and Maphie

(2025), there are several difficulties faced by the education system, including inadequate funding, inaccessible facilities, inadequate training of teachers, and negative attitudes of society toward inclusive education.

Reasonable accommodation

Issues related to reasonable accommodation have been included in Article 24 of the UNCRPD. Article 24(2)(c) mandates that nations make a reasonable effort to accommodate each person's needs to fulfil every child's entitlement to an inclusive education that meets the individual's requirements. Although this provision was previously covered in Article 5(3), its importance for inclusive education is further highlighted by its inclusion in Article 24(2)(c) regarding education. As defined in UNCRPD, a reasonable accommodation is any modification or change that is deemed necessary and suitable to ensure that all human rights are equally accessible to and enjoyed by people with disabilities or impairments (Article 2). This means that reasonable accommodations are anti-discrimination measures that must be implemented right away.

Personalised adequate support

The availability of adequate support is an essential feature of inclusive education. This is well addressed in Article 24 of the UNCRPD. Article 24(d) and (e) expressly articulate that for inclusive education to be effective, general education must provide students with disabilities with the necessary support. As in Article 24(2)(e), to achieve full inclusion, effective and personalised support measures must be provided in environments that maximise social and intellectual success. Adequate assistance is linked to and a supplement to accessibility measures.

Although support services are essential in inclusive education for disabled learners in Tanzania, there are still some challenges. Some studies on inclusive education have indicated that one of the major challenges in delivering support services is the shortage of qualified personnel and the inadequate supply of teaching-learning materials in inclusive settings (Philip, 2024; Maphie, 2025). Inclusive education, as well as the provision of support services, is also faced with inadequate training and inexperience in inclusive education (Mohammed & Almasi, 2024; Mlolele et al., 2023).

Safe and inclusive environment for learning and teaching

A quality learning environment is vital to support all students. For quality teaching and learning to occur, there should be environments that are safe, supportive, and conducive. As stated in UNCRRPD’s Article 24(3)(c), nations are required to make sure that education is provided in settings that optimize life, academic, and social development skills for people who are blind, deaf, or deafblind, and especially for children. This provision implies that education systems should create safe, inclusive and supportive quality learning environments to allow quality learning for students who have either deafness or blindness.

Other studies in Tanzania have indicated that inclusive and accessible learning environments are fundamental in improving educational outcomes for learners with disabilities (Philip, 2024; Maphie, 2025). However, for example, Maphie's (2025) study established that inadequate support services, inaccessible infrastructure, and limited specialised resources continued to hinder the effective inclusion of learners with disabilities in schools. Similarly, Philip's (2024) study found significant gaps in the provision of accessible learning environments and support systems necessary for meaningful participation. These findings implied that strengthening inclusive infrastructure, learning resources, and support services was essential for ensuring quality education and maximising the academic and social development of learners with disabilities.

Effective communication and accessibility

As defined in Article 2 of UNCRRPD, communication encompasses a variety of methods and formats encompassing textual, auditory, plain-language, tactile, human-reader, Braille, large print, accessible multimedia, augmentative and alternative forms of communication, including information and communication technology that is accessible. For a smooth run of disability-inclusive education, there should be good means of communication with students. Article 24(3) emphasizes that nations must guarantee suitable languages, forms, and means of communication for students with disabilities to learn academic skills, as well as life and social development competence. The article lists the requirements that must be met for CWDs to take part in the inclusive education system. Access to Braille and other alternative scripts, augmentative and alternative modes, a variety of communication methods,

mobility skills, orientation, peer support, mentorship, and the promotion of the deaf community's linguistic identity must all be made easier by the countries. It is underscored that inclusive measures encourage bilingual education and communication to enable hearing-impaired students to participate in the inclusive process, in addition to facilitating the integration of deaf students.

Communication plays an important role in ensuring that disability-inclusive education is effectively implemented since it ensures that learners with disabilities are able to access the necessary information for participation in learning processes. According to Article 24(3), State Parties must ensure that there are appropriate means of communication used to enhance the acquisition of academic, social, and life skills by individuals with disabilities. In Tanzania, ICTs are increasingly recognising the significance of communication among persons with disabilities (Mnyanyi, 2023). In Tanzania, the implementation of inclusive education continues to encounter challenges related to communication and accessibility. These challenges include, but are not limited to, insufficient support services, a lack of assistive tools, and inadequate teacher preparation to effectively address communication issues. Consequently, it is essential to improve teacher training, enhance communication support services, and promote the use of assistive technologies to ensure the success of inclusive education in Tanzania (Philip, 2024; Maphie, 2025).

Qualify inclusive teacher training

Teachers are a fundamental input for guaranteeing quality disability-inclusive education. The importance of skilled teachers in providing high-quality, disability-inclusive education is acknowledged in Article 24. Most importantly, all children in an inclusive education need teaching and support from qualified teachers. Article 24(4) compels nations to take the necessary steps to hire and attract qualified teachers, including those with disabilities. Teachers should be knowledgeable in Braille and/or sign language. Article 24(4) suggests that teachers must be properly educated and well-trained if they are to support all students in inclusive settings appropriately. A broad consensus regarding the vital importance of highly skilled teachers should be created for the successful implementation of disability-inclusive education. Nothing less than all students receiving instruction from qualified teachers.

This provision is based on the belief that all learners attending inclusive education should be provided with instructions by competent teachers who have been adequately trained for their duties. In their study in Tanzania, Omoro and Possi (2023) established that self-efficacy, knowledge, and instructional competence, among others, play a pivotal role in determining the level at which instructors can successfully implement inclusive classroom instructions. In addition, Mlolele et al. (2023) found that the lack of teacher training was one of the key barriers to inclusive education in public primary schools. Maphie (2025) also observed that a shortage of skilled teachers, coupled with low levels of expertise in special education, impeded effective inclusion, whereas Philip (2024) pointed out that many teachers did not have the competencies needed to teach learners with disabilities. Furthermore, Mohammed and Almasi (2024) indicated that although participation in seminars and workshops boosted teachers' knowledge and competencies, there was still an inadequate number of qualified teachers with pedagogic competencies, among other things.

Continuous professional development

High-quality disability-inclusive education learning and teaching require ongoing professional development to equip teachers and other personnel with updated competence in supporting students with disabilities. Article 24(4), expressly states to educate professionals and employees working at all educational levels to enable them to support CWDs to access education in inclusive education. This clause is significant because it addresses the necessity of preparing teachers to assist CWDs. The clause emphasizes the importance of continuous professional development for teachers and other educators pursuing a career in disability-inclusive education. Article 24(4) also stresses such professional training to include skills in using augmentative and alternative modes, and forms of communication; and disability awareness in instructional strategies, and resources. For teachers to appropriately support CWDs in an environment that grants inclusive education, there must be sufficient support in place.

This perspective on continuous professional development is consistent with recent studies in Tanzania. However, Maphie (2025) found insufficient teacher preparation and failure to access relevant training as barriers to implementing inclusive education in schools. Likewise, Philip (2024) noted

that, although there was a policy on the inclusion of special education learners in learning, teachers lacked the expertise to address the needs of children with disabilities. The above conclusions indicate that continuous professional development programmes for teachers and improvements in teacher preparation programmes are critical for developing their competencies to deliver inclusive education.

Access to lifelong learning

Ensuring the right to education involves lifelong learning. Article 24(5) requires nations to guarantee lifelong learning, and equitable opportunity to receive postsecondary and adult education as well as vocational training. This clause is substantial because it emphasizes that individuals with disabilities should access lifelong learning. Therefore, the nations should provide reasonable accommodation to guarantee the opportunity for high-quality lifelong learning.

These findings support other studies carried out in Tanzania showing that lifelong learning is an effective means of ensuring that persons with disabilities develop the required competencies. The competencies developed through lifelong learning enabled their integration into society and made them engage in economic activities (Mnyanyi, 2023; Raphael & Songambebe, 2025). As per a study carried out by Raphael and Songambebe (2025), lifelong learning programmes improved the learning of adults and helped persons with disabilities to empower themselves. Contrarily, according to Mnyanyi (2023), people with disabilities were less likely to be enrolled in adult education programmes because of insufficient funding, a shortage of assistive devices, and a labour shortage.

Tanzania's integration of Article 24 of the UNCRPD in education

Tanzania ratified UNCRPD in 2009, an international legal force to protect the human rights of CWDs, including the right to an inclusive education. By ratifying UNCRPD, especially Article 24 on quality education, the Government of Tanzania subscribes to implementing the objectives of inclusive education stated in Article 24(1): (a) enhance human potential, dignity, and self-worth, and respect for human rights and diversity; (b) develop CWDs to their fullest potentials regarding their mental and physical capabilities as well as their talents, creativity, and personalities; (c) enable

CWDs to take part and live efficiently in free society. As a result of its ratification of UNCRPD in 2009, Tanzania has domesticated and integrated Article 24 of UNCRPD into education through established legal, policy, and strategic frameworks that promote disability-inclusive education.

Legal framework

Considering that every child has the right to an education, Tanzania ratified UNCRPD in 2009. Since this ratification of UNCRPD, Tanzania has adopted two important legal frameworks. These are the Persons with Disabilities Act, 2010 and the Law of the Child Act, 2009. These frameworks have been fundamental in domesticating UNCRPD, particularly Article 24.

The Persons with Disabilities Act, 2010

Tanzania enacted the Persons with Disabilities Act in 2010 to domesticate UNCRPD. The Act explicitly states that individuals with disabilities, regardless of age or gender, shall have the same rights to education, training, and research benefits as other citizens. Section 27, for example, is especially important because it outlines the government’s obligations with regard to education for CWDs. The government pledges to ensure that every child with a disability shall (a) have equal rights when it comes to being admitted to public or private school; (b) attend regular public or private school, unless special communication is needed; and (c) receive the necessary education services or other support services related to their disability from a competent and qualified teacher.

While Section 28 of the Act stipulates that all educational institutions shall adhere to the general prohibition against discrimination against CWDs, Section 29 emphasises that (a) all managers and owners of educational institutions shall consider the special needs of individuals with disabilities when making admission decisions; (b) anyone who owns or establishes a special school for individuals with disabilities shall provide sufficient facilities for such purposes; and (c) special schools shall be the transition towards inclusive schools. Despite the sections that state the intention to ensure education for CWDs, the Act does not provide a specific definition of inclusive education.

The Law of the Child Act of 2009, revised edition of 2019

Tanzania enacted the Law of the Child Act in 2009, which was revised in 2019 to ensure the rights of CWDs to education and other social welfare. Specifically, Section 5 of the Act forbids discrimination against children, including on the basis of disability, in accordance with the UNCRPD. Additionally, Section 8 requires parents, guardians, or anyone else with custody of a child to treat a child with a disability with dignity. Its sub-section 6 also guarantees CWDs special care, treatment, and reasonably affordable facilities for rehabilitation, as well as equal access to education and training wherever possible to help them reach their full potential and become self-sufficient. Section 13 of the Act emphasises that a child cannot be subjected to "torture or other cruel, inhuman punishment or degrading treatment, including any cultural practice which dehumanises or is injurious to the physical and mental well-being of a child." Although it does not define inclusive education, the Act is in line with UNCRPD, as it provides rights to education and other services, such as health services, to all children, including CWDs, as well as prohibiting discrimination against them.

Policy framework

The Tanzanian Education and Training Policy (ETP) of 2014, Edition 2023, emphasises an inclusive education system to guarantee every child the right to an education. The policy emphasises all students, including those with special educational needs, learn alongside one another in age-appropriate classrooms in their local communities. In order to ensure that students with special educational needs may fully participate in the formal education system, the government has been working with stakeholders to improve the learning and teaching environment. Through this policy, the government set a policy goal to deliver inclusive education: "to enhance the delivery of inclusive education and training at all levels". To achieve this goal, the government has set two policy statements: (a) to strengthen the system for identifying the special needs of each student...; and (b) ... to "ensure the existence of conducive environments for the provision of inclusive education and training (URT, 2023, p. 41)."

Strategic framework

To integrate UNCRPD's Article 24 in education, Tanzania has undertaken measures specific to inclusive education by developing National Strategies

on Inclusive Education (NSIE), namely NSIE (2009-17) and its successors, NSIE (2018-21) and the current NSIE (2021/22-2025/26).

National Strategies on Inclusive Education (2009-17)

Notably, NSIE (2009-17) was the first strategy and influential on Tanzania’s development of inclusive education. The strategy had one goal: to ensure that “all children, youths, and adults in Tanzania have equitable access to quality education in inclusive settings” (URT, 2009, p. 3). The stated goal could be attained through the following obligations: “educational policies and programmes are informed by inclusive values and practices; teaching and learning respond to the diverse needs of learners; educational support is available to all learners; professional capabilities for inclusive education are widened and strengthened; and community ownership of and participation in inclusive education are enhanced” (URT, 2009, p. 3).

Accordingly, consistent with the UNCRRPD’s Article 24(3), *inter alia*, NSIE (2009-17) provided that:

- schools must provide short-term or long-term comprehensive courses to students with disabilities, including competencies in Braille, alternative communication methods, mobility and orientation, etc. These skills would also be provided to teachers.
- schools must cater to the deaf learners and ensure that schools employ Tanzanian Sign Language for teaching and learning.
- teachers who work with the deaf should be knowledgeable in Tanzanian Sign Language proficiency, and it should be part of their certification.
- schools for the Deaf must be maintained in order to provide deaf students with an appropriate language environment; deaf students use sign language, and they need a setting where they can practise and develop such language.
- schools should support the Deaf students’ communication and learning needs in schools and other educational institutions.

National Strategies on Inclusive Education (2018–21)

The goals of NSIE (2018–21), which succeeded NSIE (2009–17), primarily concentrated on four major areas. These include: (a) improving fair access to and enrolment in pre-primary school; (b) improving fair access to and

involvement in formal and informal mainstream educational pathways for children who fall into the designated vulnerable categories; (c) ensuring that children in the designated vulnerable categories successfully complete their education cycles; and (d) improving learning outcomes at the primary and ordinary secondary education levels for children in the designated vulnerable categories (URT, 2017). The overall goal of this strategy was to provide vulnerable groups with more participation in and equitable access to pre-primary and primary education, as well as to establish supportive school systems and learning environments that would enable them to successfully complete and achieve learning outcomes in both formal and informal basic education pathways. Various coordinated efforts focused on putting the specified methods into practice.

Among the attempts at punchlines in NSIE (2018–21) included:

- a nationwide initiative of identifying CWDs with the purpose placing some CWDs in educational programmes, while others receiving appropriate assistance.
- equipping schools with accessible instructional resources, and assistive technologies to foster the development of pre-literacy and pre-numeracy skills.
- printing books with large print and braille, among other teaching and learning resources, and sending them to schools across the nation.
- increasing budgetary allocation and disbursement for the procuring and distributing specialised educational equipment and assistive devices resources.
- Updating college-based pre-service teacher education programme to include elements of inclusive education.
- trainings pre-service and in-service tutors on inclusive education, sign language and deaf pedagogy, and identifying and providing assistance to children with different needs.
- building and renovating educational facilities to accommodate accessibility concerns.

National Strategies on Inclusive Education (2021/22-2025/26)

This is the current Strategy with the strategic vision: “To have an education system which ensure full participation of learners with special educational needs in inclusive settings and form the foundation for an inclusive society,” and strategic goal: “To provide access and quality inclusive education at all levels for learners with special educational needs (URT, 2021, p. 44).” The Strategy addresses inclusive education through the following are the strategic objectives:

- education policy, legislation and guidelines are informed by inclusive values and practices;
- equitable access and participation of learners with diverse needs and provision of quality inclusive education promoted at all levels;
- inclusive culture among policy makers, decision makers, education practitioners and community members promoted;
- improved coordination and collaboration among education stakeholders in delivering inclusive education; and
- improved quality assurance, monitoring and evaluation mechanism informed by proper data management from schools, educational institutions and stakeholders in the implementation of the strategy (URT, 2021, pp. 43-4).

Delivery of education for CWDs

In this review, it was found that education for CWDs in Tanzania is delivered in three systems primary and secondary schools: special school system, special unit system and inclusive school system. In special school system, only CWDs are registered. The severity and category of the learner’s disability determines the set-up of the special schools. Students with physical, cognitive, auditory, or visual impairments might attend special schools. An education system known as the “special unit system” assigns a CWD unit to a regular school. It is well noted in NSIE (2009-17) that in special unit system, the separate classes (integrated special needs education units) for learners with disabilities are placed in some regular schools. While many integrated units are day units, some have boarding facilities to support CWDs (URT,

2009). In inclusive school system, the central principle is to allow all children, regardless of any challenges or differences they may have, to learn together whenever possible. NSIE (2021-26) describes inclusive school as a school that creates as well as provides “whatever is necessary to ensure that all learners have access to meaningful learning” (URT, 2021, p. 69). Tanzania’s Persons with Disabilities Act 2010 ascribes inclusive school as ... “a place where barriers have been removed to enable students with disabilities to learn and participate effectively within the general school system” (URT, 2010, p. 8). Inclusive schools provide and create equal educational opportunities for every child, irrespective of their disabilities or backgrounds.

Definition of inclusive education

In Tanzania, inclusive education is broadly defined. On one hand, in the context of Tanzania, NSIE (2009-17) describes inclusive education to be:

“ a system of education in which all children, youths and adults are enrolled, actively participate and achieve in regular schools and other educational programmes regardless of their diverse backgrounds and abilities, without discrimination, through minimization of barriers and maximization of resources (URT, 2009, p. 2).

From this definition, NSIE (2009-17) emphasises that inclusive education recognises and addresses the obstacles that arise in the field of education as a learner interacts with their school setting using an array of instructional assistance programmes. As stated in NSIE (2009-17), inclusive education in Tanzania strives on removal of barriers to attendance, participation, and education of all persons in regular educational institutions. The Strategy describes that presence is “physical, social and economic access to education as well as retention in schools and other educational programmes” up to the end of the study programmes; participation means “learners’ active involvement in the whole process of education”; and learning means “a complex interaction between the learners, their environment and the curricula” (URT, 2009, p. 14). Obstacles to attendance, participation, and education can be: (a) within a learner (e.g. learner’s disability, psychological disorders, life circumstances, etc.), and (b) within the learner’s environment

(e.g. within the learner's living and learning environment, curriculum and teaching methods, school management structure etc.) (URT, 2009).

Drawing from NSIE's definition, key features of inclusive education in the Tanzanian context include, inter alia:

- a kind education system in which all persons are registered,
- everyone successfully engages in and participates in regular education programs or schools,
- non-discrimination of persons from different backgrounds and abilities,
- removal of all barriers to participation, attendance, and education of all persons in regular schools and,
- extension of resources needed to support all persons to engage in active participation and succeed in regular schools.

On the other hand, the NSIE's (2009-17) successor, NSIE (2018-21) describes that inclusive education entails:

“ an approach that transforms the education system, including its structure, policies, practices, and human resources, to accommodate all learners in mainstream education, addressing and responding to learners's diverse needs. It involves, among others, adaptation and modification of curriculum content, teaching and learning materials, pedagogy, and environment to ensure access to and participation in quality education for all learners, irrespective of their disabilities and special learning needs (URT, 2017, p. 12).

Through this definition, it is clear tha Tanzania needs to adopt a proactive approach to transforming education system, creating policies, culture, and educational environments that minimize obstacles to attendance, engagement, and learning. It is also clear that the government has taken initiatives for reasonable accommodations and adjustments to include CWDs in mainstream education. Similarly, NSIE (2021/22-2025/6 outlines that inclusive education is:

“ a system of education in which all learners are enrolled, actively participate, and achieve in regular educational settings and other educational programmes regardless of their diverse backgrounds and abilities, without discrimination, through minimization of barriers and maximization of resources. [It] involves the transformation of policies, legislation, regulations, processes, structures, infrastructure, practices, and human resources to support the accommodation of all learners to learn together wherever possible, regardless of any difficulties or differences they may have (URT, 2021, p. 3).

Generally, the Tanzanian government is dedicated to two main objectives in this regard. One is to guarantee the removal of structural and systemic obstacles that prevent some Tanzanian groups from exercising their right to get, fully engage in, learn, and complete all levels of education. The second is to make an effort and guarantee that, at all educational levels, regardless of any challenges or distinctions, all students do, whenever feasible, learn together. It is noteworthy that the government is well aware that, at least at some point in their academic careers, certain students may not be suited for inclusive environments.

Achievements in alignment of Article 24 of UNCRPD

During the implementation of legal, policy and strategic frameworks Tanzania attained several achievements. The following are some of the potential achievements:

Early identification, assessment, and teaching

During the implementation of NSIE (2009–17), Tanzania, through MoEST, developed Education Support and Resource Assessment Centres (ESRACs) (URT, 2017) purposely to promote: (a) early special needs identification and evaluation; (b) care and assistance for children with low vision and albinism; (c) teaching the 3Rs to children with blindness or deaf children; (d) teaching children who have autism and intellectual disabilities. Tanzania has advanced much in the diagnosis, identification and evaluation of CWDs, as well as improved provisions for CWDs through ESRAC. Among other things,

ESRAC's efforts have assisted in locating, assessing, and enrolling students with disabilities in inclusive educational settings in earnest years (URT, 2021). Furthermore, Tanzania created assessment kits through MoEST and purchased and provided teaching tools and assistive technology for students with disabilities to educational institutions around the nation (URT, 2017).

Preparing qualified teachers

The Article 24(4) of UNCRPD provides that nations “shall employ teachers, including teachers with disabilities, who are qualified in sign language and/or Braille, and to train professionals and staff who work at all levels of education” (UN, 2006, *ibid.*). Prior to and at ratification of UNCRPD, Tanzania had acute shortage of competent and professional teachers to support and manage inclusive education at all levels of education (URT, 2009). Through NSIE (2009–17), the Country made a great effort to prepare and employ competent and qualified teachers to support disability-inclusive education. Objective four (4) of NSIE (2009–17) strategically addressed professional personnel development for disability-inclusive education.

Professional personnel development

In NSIEs, especially NSIEs (2009–17), the Government attained a number of achievements related to training teachers for inclusive education, especially:

- Tanzania Institute of Education’s (TIE) Inclusive Education Kit, which helps teachers learn about inclusive education;
- Patandi Teacher Training College's Open and Distance Learning (ODL) programme, which trains on-job teachers about inclusive education and special needs for CWDs in partnership with the National Council for Technical Education (NACTE);

Supplies and facilities

Tanzania has made significant strides in terms of infrastructure and materials. For instance, the NSIE (2018–2021) identifies, among other things, the following: (a) building new inclusive educational infrastructure and upscaling existing infrastructure to ensure that environments and classrooms are significantly inclusive; (b) continuing to purchase and supply inclusive teaching and learning materials; and (c) continuing to establish and support satellite centers to house young children who are unable to attend school, including those with disabilities (URT, 2021).

Enrolment of students with disabilities

The domestication and integration of Article 24 of the UNCRPD and the implementation of interventions established through legal, policy, and strategic frameworks that promote disability-inclusive education have resulted in an increase in the enrolment of students with disabilities in schools. For example, as stated in the Education and Training Policy 2014, 2023 Edition:

- the number of students with special needs enrolled in pre-primary education rose from 4,171 (2,502 boys; 1,669 girls) in 2016 to 6,120 (3,575 boys; 2,545 girls) in 2022.
- there were 66,372 (37,830 boys; 28,542 girls) students with special needs enrolled in primary schools in 2022, up from 37,034 (21,151 boys; 15,883 girls) in 2016.
- there were 13,142 (6,422 boys; 6,720 girls) secondary school students with special needs, up from 7,512 (3,920 boys; 3,592 girls) in 2016.
- there were 13,142 (6,422 boys; 6,720 girls) students with special needs enrolled in technical colleges in 2022, up from 108 (56 boys; 52 girls) in 2016.

Challenges

Despite the achievements in implementing disability inclusive education, there are several challenges affecting the delivery of disability-inclusive education. Specifically, NSIE (2021/22-2025/6) outlines the following challenges:

- Although the National Education Act No. 25 of 1978 and its subsequent amendments acknowledge and guarantee the right to education, disability-inclusive education is not expressly covered by them.
- There are not enough qualified educators to oversee disability-inclusive classrooms at all educational levels.
- Persistently negative societal attitudes towards individuals with special educational needs in communities and educational settings, as well as inherent and unabating social-cultural behaviours,

conventions, and ideological dispositions that discriminate against them.

- The absence of an efficient system for communication and coordination between actors in the education sector and those implementing the disability inclusive education approach.
- The majority of political leaders and government officials lack sufficient knowledge and awareness of disability inclusive education.
- The lack of adequate funding for disability-inclusive education.
- The persistent and exacerbating structural poverty and associated challenges.
- The prevalence of environmental, infrastructure, and communication barriers.
- The unknown the exact number of individuals with SEN and their specific needs.

4. Conclusion

It is well known that UNCRPD is the first legally international human rights-based Convention that recognizes inclusive education as the right of all people. Notably, UNCRPD's Article 24 affirms that individuals with disabilities have equal opportunities for education as others with disabilities. The Article guarantees the right to inclusive education and prohibits discrimination against CWDs in education. Its specific goal is to remove barriers to social and educational engagement. It requires nations to take action to guarantee the inclusion of CWDs in regular schools.

It is important to remember that, in order to fully implement Article 24 (1) (a), “education must be directed at the strengthening of respect for human rights and human diversity, as well as the full development of the human potential and sense of dignity and self-worth” (Committee on the Rights of Persons with Disabilities [CRPD], 2016, p. 6). In order to implement Article 24 (1) (b), “education should be directed to the development of persons with disabilities' personalities, talents, and creativity, as well as their mental, physical, and communicational abilities, to their fullest potential” (CRPD, 2016, p. 6). In order to achieve Article 24(1)(c), CRPD (2016) highlights that

“the aims of education must be directed at enabling persons with disabilities to participate fully and effectively in a free society” (p. 6).

As stated in Article 24 of the UNCRPD, nations must guarantee the equitable acquisition of inclusive, free, and compulsory education for all people. Article 24 contains a clause on the employment of qualified teachers with the capacity of using sign language and/or braille, and a provision on disability awareness training for staff working at all education levels. Additionally, reasonable accommodations and the accessibility of learning environments, including the provision of accessible educational materials, are mandated under Article 24. Enacting anti-discrimination legislation, offering financial assistance, and spreading awareness of inclusive education are equally important.

Article 24 of UNCRPD has several implications for the provision of inclusive education. Some of these implications are:

- to establish special education as the exception and inclusive education as the principle.
- disability-inclusive education is a fundamental tool that promotes the complete development of students with disabilities' personalities, skills, and creative abilities, and their mental and physical capacities
- disability-inclusive education is a vital instrument that supports the full development of CWDs to the extent possible of their mental and physical capacity as well as their personalities, skills, and creative abilities.
- there are three very important guiding principles which are necessary to ensure that CWDs access an inclusive education. These are non-discrimination, adequate personalized support, and reasonable accommodation.
- all children, especially those with blindness and deafness, require instruction in braille, sign language, mobility, and everyday life skills. Additionally, hiring personnel with skills in sign language and/or braille is necessary.
- consistent with a full inclusion approach, all students should be taught together in inclusive setting

- rejection of special education groupings, as well as any type of ‘special intervention’, which sometimes can lead to stigmatization of students with disabilities
- all students learn best in an environment with effective communication and reasonable accommodation that offers the best opportunities for life and academic development skills
- the need for countries to prioritize disability-inclusive services by laws and policies

Importantly, to make inclusive education the principle, measures must be taken in order to promote inclusive education for CWDs. Reference to UNCRPD’s Article 24, it is required to make a reasonable accommodation for students with disabilities so they can attend regular schools. Supportive measures must also be implemented if CWDs are to be included in the regular schools. At the end, fully implementation of Article 24 of UNCRPD in education system embraces disability-inclusive education. Based on Article 24 of UNCRPD, specific inclusive education strategic framework must:

- forbid discrimination based on a person's disability.
- ensure that students can access inclusive learning opportunities on an equal basis, regardless of their disability.
- provide appropriate accommodations for all CWDs.
- ensure that the design and construction of all new schools adhere to a reasonable level of accessibility.
- establish a timeline for modifying current schools to ensure they adhere to a reasonable level of accessibility.
- provide a standardized framework for identifying, evaluating, and assisting people with disabilities.
- mandate that all students have access to the national curriculum and provide a framework for curriculum adaptation for students with disabilities as needed.
- provide students with access to assistive technology, such as braille materials, alternate script, augmentative and alternative forms of communication, mobility skills, and orientation, if necessary.
- provide deaf and hard-of-hearing pupils with the chance to acquire and receive instruction in the sign language of the community.

- create a complaints process that is efficient, enforceable, safe, and accessible for contesting any breaches of the right to an education.

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6. Short Biography

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Biodiversity of Conscience: An Internal Framework Model for Ethical Pluralism in Higher Education

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Abstract

This article addresses a central challenge in higher education ethics: how can institutions cultivate morally resilient, ethically agile graduates and leaders in the face of growing value pluralism? Conscience is commonly conceptualised as a single-voiced, immutable inner judge — a view that insufficiently accounts for its dynamic, context-sensitive nature. Drawing on a metaphor from ecological biodiversity, this article introduces the Internal Biodiversity Framework (IBF), which reconceptualises conscience as an internal ecosystem of distinct ethical voices. Synthesising insights from psychodynamic theory, moral psychology, neurobiology, and traditions of Eastern and Western philosophy, the IBF proposes that ethical voice diversity strengthens moral resilience, enhances consilience (the creative integration of competing ethical perspectives), and acts as a natural buffer against ethical burnout and nocebo effects. The framework offers concrete, field-tested tools for higher education pedagogy, academic leadership development, and coaching, including an Ethical Voice Diary, an Ethical Ecosystem Map, and an Orchestra Conductor Protocol. Testable hypotheses are also proposed for future empirical validation through a draft Ethical Pluralism Scale. By repositioning conscience from a monolithic judge to a living ecosystem, the IBF provides higher education institutions with a principled, pluralistic approach to ethics education that resists both moral relativism and ethical monoculture.

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1. Introduction

When we hear the word conscience, most of us imagine a single voice: an inner judge or tribunal. Yet modern philosophy from Galton onwards has recognised what Galton called the "Antechamber of Consciousness" (Galton 1883)—a sophisticated system where multiple voices, forces, and perspectives coexist and coordinate. This philosophical tradition, developed through Nietzsche, Hartmann, and Ribot, provides rich historical grounding for reconceptualising conscience as an internal ecosystem of diverse ethical voices.

This article aims to reconceptualise this polyphonic structure through the metaphor of biodiversity. Studies in botany and biodiversity have demonstrated the functional importance of diversity in nature: ecosystems with greater species richness are more resilient, adaptive, and productive than monocultures (Wilson 1998; Kimmerer 2013). Following this insight, the article proposes extending the same logic to the inner world of the human being: like a rainforest, conscience harbours different ethical voices. Compassion is one voice; justice is another; loyalty, freedom, responsibility, shame, pride, gratitude, disgust — all are native inhabitants of the ecosystem of conscience. This ecological reconceptualisation of conscience builds on the author's earlier applied work in Botanical Coaching, which first translated biodiversity metaphors into developmental and coaching practice (Çetin 2026).

This article specifically addresses how higher education can cultivate awareness of this ethical polyphony through structured pedagogical practices. The framework developed here—the Internal Biodiversity Framework (IBF)—generates concrete educational tools (Ethical Voice Diary, Ecosystem Map, Orchestra Conductor Protocol) designed to help students recognise and integrate multiple ethical perspectives in navigating complex moral situations.

Although the IBF has applications across all educational levels and professional fields, this article focuses specifically on its relevance for higher education contexts. Universities and professional schools face a distinctive

ethical challenge: they must prepare graduates not only with disciplinary knowledge but with the moral agility to navigate complex, contested value landscapes. In professional ethics courses, teacher training programmes, and academic leadership development, this framework offers a conceptual anchor and a practical toolkit. The article proceeds as follows: after establishing the conceptual and methodological foundations, it traces the empirical and philosophical support for ethical polyphony, develops the biodiversity metaphor with careful attention to its limits, examines why diversity matters functionally, and then presents concrete pedagogical and leadership applications before concluding with a future research agenda.

1.1 Ethics and Morality: A Conceptual and Lived Distinction

At a conceptual level, morality refers to the ready-made set of “right/wrong” rules that a society, culture, or religion presents to the individual. Ethics, by contrast, is the philosophical discipline that questions why those rules are right and that seeks a rational ground for decision-making when different rules come into conflict. This distinction is not merely academic: it has direct pedagogical implications for higher education. Moral instruction transmits norms; ethical education cultivates the capacity for reflective deliberation (Freire 1970; Noddings 1984).

At a lived level: is it right to tell a small lie to protect a friend? Morality simply recalls the rule “do not lie.” Ethics, however, asks: “Would telling a lie in this situation lead to a greater good?” — weighing conflicting values (honesty against loyalty) and trying to reach a reasoned decision. Conscience is precisely the internalised result of this ethical deliberation. In higher education settings, students regularly encounter such dilemmas — in clinical placements, research ethics, and professional practice — where ready-made moral rules provide insufficient guidance. This article therefore treats conscience not as a memorised set of moral rules but as a dynamic ecosystem of ethical deliberation that can be cultivated through education.

1.2 Methodological Note: Conceptual-Analytic Framework and Scope

This article employs a conceptual-analytic methodology, synthesising theoretical frameworks from moral psychology, philosophy, neurobiology, and educational theory to construct a novel conceptual model. No primary empirical data are collected or analysed here; the IBF is positioned as a theoretical framework awaiting empirical validation. This approach is consistent with established practice in ethics education scholarship, where conceptual innovations frequently precede and inform empirical research (cf. Kohlberg 1981; Gilligan 1982; Haidt/Graham 2007). The limitations of this approach — in particular, the absence of quantitative or qualitative field data — are explicitly acknowledged, and a future empirical research agenda is outlined in Section 7.2.

Throughout this article, the biodiversity metaphor is used as an explanatory and heuristic tool; it does not carry any reductionist, biological determinist, or evolutionary claim. Unlike biological ecosystems, the human conscience is shaped by culture, language, education, history, and conscious choice. The article explicitly distances itself from social Darwinism and from any reading that would reduce moral agency to ecological mechanics. A threefold structure is maintained consistently: conscience begins with a neurobiological predisposition, is shaped by cultural and individual experience, and can be transformed through conscious reflective practice — a structure well-supported by developmental theory (Bronfenbrenner 1979; Piaget 1932) and consistent with the educational philosophy of conscientisation (Freire 1970).

Finally, it should be noted that the IBF shares conceptual territory with established plural-self models such as Internal Family Systems (IFS) and Dialogical Self Theory. The precise ways in which the IBF both draws on and departs from these traditions are examined in Section 2.5. The article's core originality lies not in the recognition that the self is plural — that insight has rich precedent — but in the ecological conceptualisation of that plurality and the specific educational, leadership, and coaching applications that follow from it.

2. Foundations of the Ethical Polyphony of Conscience

2.1 Psychodynamic and Developmental Contributions

Main claim: Conscience is a dynamic, layered structure in which internal tension is developmentally inevitable and functionally productive.

Sections 2.1.1–2.1.3 read Friedrich Nietzsche, Eduard von Hartmann, and Théodule Ribot directly from their own texts, since each engaged the organism and consciousness in ways that ground the IBF. That these three form a single philosophical tradition is established by Nietzsche scholars since 1980’ (H.E. Lampl, *Le flair du livre*, 1988; also later I. Haaz, *Les conceptions du corps chez Ribot et Nietzsche*, 2002; J.-C. Wolf, *Eduard von Hartmann*, 2 vol. 2006) and trace the continuity between their organism-based accounts of consciousness and ethics. The reading below works from the primary sources and credits Haaz for that historical frame.

Sigmund Freud divided the human mind into id, ego, and superego (Freud 1923). The superego — the seat of moral internalisation — is itself composite: it integrates parental injunctions, cultural norms, and ideals that may conflict. Carl Jung argued that conscience is further shaped by archetypes drawing on the collective unconscious, introducing an irreducible depth to moral experience (Jung 1959). Jean Piaget identified two fundamental stages of ethical development — heteronomous and autonomous morality — demonstrating that even in childhood, moral understanding is not a static download but an evolving construction (Piaget 1932). Lawrence Kohlberg expanded this framework into six stages, each representing a qualitatively different relationship between self, others, and moral principle (Kohlberg 1981). These developmental models converge on a shared insight: conscience is a layered, increasingly polyphonic structure that evolves over time. The IBF extends this insight by treating the polyphony not as a transitional imperfection to be overcome but as the mature form of ethical functioning.

In higher education, this developmental perspective has direct pedagogical implications. Students entering university often operate at conventional moral stages, deferring to authority or peer norms. Ethics education — when designed around genuine dilemmatic enquiry rather than rule transmission — can support transition to post-conventional reasoning (Rest et al. 1999). The IBF's concept of ethical voice diversity offers educators a concrete framework for designing such experiences.

2.1.1 Friedrich Nietzsche and the Organism as Polyphony of Instincts

Nietzsche's natural-scientific reading of the human organism provides essential historical grounding for the IBF's conceptualisation of conscience as an internal ecosystem. Contrary to popular misreadings of Nietzsche as a theorist of perspectival values, Nietzsche was fundamentally concerned with the biological reality of the organism as a plurality of instincts and centres of control that must coordinate internally without reducing to a single voice. Drawing on 19th-century neurophysiology and Darwinian thought, Nietzsche reconceptualised willing itself as fundamentally plural. In Aphorism 19 of *Beyond Good and Evil*, Nietzsche describes the body as "a social structure composed of many 'souls'" (*Jenseits von Gut und Böse*, Aphorismus 19), in which commanding and obeying occur simultaneously (Nietzsche 1886, §19, p. 31 Kaufmann trans.).

The conscience, in Nietzsche's account, is not a judge standing above this biological complexity but a weak filtering apparatus serving an organism of extraordinary internal richness. Consciousness is the instrument through which the organism presents to itself a simplified, coherent picture of what is in fact a continuous internal coordination among competing drives. This polyphony of instincts — the irreducible plurality of forces within the body — operates through what Nietzsche calls "command and obedience": a myriad of subordinate faculties in the psyche coordinate themselves through dynamic leadership, without any one voice achieving permanent dominance. Crucially, this internal combat is not literal warfare but paradoxical coordination — the struggle itself is the mechanism by which diverse organic elements of different ranks subordinate themselves to multiple dynamic command centres whose authority shifts according to circumstance.

For the IBF, Nietzsche’s naturalistic vision replaces the theological fiction of a unified conscience with a biological reality: the mature ethical self is one in which multiple instinctual voices achieve dynamic coordination rather than suppression. The apparent unity of conscience masks a fundamental plurality of drives and centres of control. Ethical development, in this Nietzschean framework, is not the elimination of competing voices but their maturation into genuine coordination.

2.1.2 Eduard von Hartmann on Multiple Consciousnesses and Subordinate Vitality

The German philosopher Eduard von Hartmann (1869) developed a sophisticated account of the plurality of consciousnesses within the organism in his *Philosophie des Unbewussten*. Hartmann argued that the organism does not function as a unified consciousness but rather as “a collection of partial organisms — a higher-order individual containing within its depths and subordinating to itself a multitude of other individuals, each possessing its own life” (Hartmann 1869, *Philosophie des Unbewussten*). Each partial consciousness possesses its own vitality and tendency—a position fundamentally distinct from Enlightenment rationalism’s assumption of unified consciousness. This Counter-Enlightenment view received a scholarly analysis (J.-Cl. Wolf, 2006) which demonstrated the foundational importance of Hartmann’s account to understanding conscience as composed of multiple, coordinated centres of decision-making and ethical accountability.

Hartmann’s cardinal insight is that consciousness and will at the highest levels function not as commanding authorities but as filtering and coordinating apparatuses, is building on Schopenhauerian voluntarism, Hegelian and Schelling’s categories. The organism, in this conception, requires central regulation not through suppression of subordinate vitalities but through orchestrated coordination that respects the integrity of each subordinate system. These partial consciousnesses are not defects or developmental stages to be overcome; they are constitutive features of biological organisation itself—what Hartmann (1869) termed the fundamental structure of all living complexity.

For the IBF, Hartmann's framework establishes the biological reality of ethical polyphony without resorting to either mechanical models or mystical unity. The conscience that appears as singular to the individual is actually a dynamic coordination of multiple consciousnesses, each contributing its own perspective and tendency. The mature ethical self is not one that has eliminated internal plurality but one that has achieved genuine coordination among multiple centres of responsibility and decision-making. This coordination is neither hierarchy (where lower voices are suppressed) nor chaos (where voices contradict without integrating), but dynamic orchestration wherein different vocal ranges contribute their full capacity to the whole.

2.1.3 Théodule Ribot and the Coordination of Psychological Functions

Ribot, founder of the *Revue philosophique* (1876) and pioneer of modern psychology, provided crucial theoretical scaffolding for understanding the functional organisation of internal ethical plurality. Ribot's cardinal contribution was the distinction between evolution and dissolution — between the coordination of psychological functions in health and their *désagrégation* in pathology. Ribot demonstrated that will, memory, and personality are not singular entities but complexes of coordinated functions; their strength depends not on the dominance of a single voice but on the degree of coordination among their component parts. In health, coordination and stability constitute the fundamental condition; in pathology, incoordination and instability are the markers of functional dissolution.

Ribot's concept of coordination is not the triumph of a single voice over competitors, but the dynamic integration of multiple impulses under shifting leadership. Weakness of will, for Ribot, is not the failure of a strong voice to dominate; rather, it is the disconnection and oscillation among multiple impulses lacking a coordinating centre. In Ribot's formulation, strength of will derives from the coordination of impulses under a single predominant impulse; weakness results from their disintegration and oscillation without systematic organisation (Ribot 1883, *Les maladies de la volonté*, Ch. I). The multiplicity of impulses is not itself pathological; rather, pathology emerges precisely when these multiple impulses lack effective coordination.

For the IBF, Ribot’s framework establishes that ethical functioning depends on genuine coordination rather than hierarchy or suppression. An ethical voice that is silenced rather than coordinated does not disappear; it operates as a disrupting force beneath consciousness, generating the internal discord that Ribot identified as characteristic of dissolution. The mature ethical self is one in which all voices remain active, but organised under dynamic coordination that permits both integrity and responsiveness. This is what Ribot meant by “health” — not the triumph of one function but the coordinated plurality of all functions working toward common ends.

2.1.4 Integration: The Organism, Polyphony, and Coordination as Historical Synthesis

The three thinkers examined in Sections 2.1.1–2.1.3 — Nietzsche, Hartmann, and Ribot — constitute a unified 19th-century philosophical and scientific tradition concerning the organism and its internal complexity. Nietzsche reconceptualised conscience from a judge into a weak filtering apparatus serving a biological multiplicity. Hartmann established that multiple consciousnesses coexist within the organism, each with its own vitality, coordinated but not unified under a single supreme authority. Ribot provided the functional vocabulary for understanding this coordination: the distinction between health (genuine coordination of multiple functions) and pathology (*désagrégation* and incoordination). Together, these three thinkers grounded ethical polyphony not in philosophical abstraction but in naturalistic observation of the organism’s irreducible complexity.

This historical synthesis is not merely scholarly antiquarianism. The IBF’s central metaphor — conscience as an internal ecosystem — is rooted in this precise biological vision: the organism is not a monolith but a collection of partial organisms, each with its own tendency, coordinated through dynamic leadership that respects the integrity of each voice rather than suppressing alternatives. The ethical maturity that the IBF seeks to cultivate in students is precisely this: the capacity to maintain multiple ethical voices in active coordination, neither reducing them to a single dominant register nor allowing them to fragment into unintegrated discord. The functional ecology of conscience, in this light, is not a novel invention but a translation of 19th-

century natural philosophy into contemporary educational and psychological practice.

The historical continuity of Nietzsche, Hartmann, and Ribot as a unified tradition of organism-based psychology and natural philosophy is established through foundational comparative scholarship found in the Nietzsche Research/Studies, which systematically demonstrated the philosophical and conceptual links among these thinkers, establishing them as a coherent tradition in European natural philosophy and psychology. The IBF's reconceptualisation of this tradition through ecological metaphor builds directly on the historical synthesis that this scholarship first established, extending it into contemporary educational and psychological practice.

2.2 Care Ethics and Social Interest

Main claim: Ethics is not built solely on justice and rights; care, responsibility, and relationality are equally fundamental ethical voices, and their inclusion is especially consequential in higher education.

Having established the historical and biological foundations of ethical polyphony in the 19th-century organism tradition (Sections 2.1.1–2.1.4), we now turn to the contemporary empirical and philosophical support for this pluralistic vision. The framework below shows how the IBF draws on multiple modern research traditions — developmental psychology, care ethics, neurobiology, and moral psychology — to substantiate the claim that ethical diversity is not a deficiency but a constitutive feature of mature moral functioning. Each section establishes one dimension of this plurality and its functional significance for ethical resilience and educational practice.

Carol Gilligan's foundational critique of Kohlberg argued that his justice-centred framework systematically undervalued a "different voice" oriented towards care, relationship, and contextual sensitivity (Gilligan 1982). Nel Noddings systematised this approach into a relational ethics of care that has since profoundly influenced educational philosophy (Noddings 1984). Alfred Adler, working from a different tradition, defined *Gemeinschaftsgefühl* (social interest) — the sense of belonging to and responsibility for a human community — as a central criterion of psychological health (Adler 1929). In

higher education specifically, care ethics has informed debates about student wellbeing, inclusive pedagogy, and the ethics of mentorship (Noddings 1984). The biodiversity of conscience thus encompasses not only the voice of justice but also the voices of care and social interest — both of which must be cultivated in graduates entering professions with significant relational responsibilities.

2.3 Neurobiological Foundations

Main claim: Ethical reasoning is distributed across multiple neural systems, providing a neurobiological basis for the plurality of ethical voices posited by the IBF.

Koenigs et al. (2007) demonstrated that individuals with damage to the ventromedial prefrontal cortex make systematically different utilitarian judgements, suggesting that affective processing is not an obstacle to moral reasoning but a constitutive component of it. These findings align with Antonio Damasio’s somatic marker hypothesis: emotion and reason are not opponents but collaborators in moral judgement (Damasio 1994). The representation of different ethical voices in distinct but interacting neural systems provides a neurobiological foundation for the IBF’s central claim that ethical plurality is not a defect of cognition but an architectural feature of the moral mind.

2.3.1 The Neural Network of the Heart and Ethical Intuition

Main claim: The heart’s intrinsic nervous system processes information independently of the brain, and heart–brain coherence is associated with enhanced ethical intuition and emotional regulation — a finding with implications for somatic ethics education.

Ancient traditions across cultures — the Huangdi Neiijing (Veith 2002), Al-Ghazali (1058–1111), and Anatolian Sufi philosophy — regarded the heart as the centre of ethical intuition. Modern neuroscience has documented that the heart possesses an intrinsic nervous system of approximately 40,000 neurons capable of independent processing (Armour 1991), providing one neurobiological basis for the phenomenological association between somatic states and ethical sensitivity. The claim that heart–brain coherence produces

enhanced ethical decision-making remains speculative and requires further empirical validation (McCraty 2015 reports correlations that have not been independently replicated in mainstream neuroscience). What the IBF draws on instead is better established: somatic awareness and interoceptive sensitivity are recognised in psychology and neuroscience as foundational to emotion regulation and ethical judgment (Garfinkel/Critchley 2013). This suggests that body-aware practices such as reflective mindfulness may cultivate ethical sensitivity alongside formal philosophical reasoning. The use here is heuristic; the physiology of cardiac function lies outside the scope of this article. The ecosystem of conscience encompasses both innate competencies (echoing Leibniz's critique of Locke's pure empiricism) and environmental influences—neither nature nor nurture alone, but their dynamic interaction.

2.4 Moral Foundations Theory

Main claim: Human ethics is composed of at least six fundamental dimensions; individual differences in weighting these dimensions constitute a form of ethical diversity rather than a hierarchy of deficiency.

Jonathan Haidt's Moral Foundations Theory (MFT) identifies six dimensions along which moral intuitions vary across individuals and cultures: care/harm, fairness/cheating, loyalty/betrayal, authority/subversion, sanctity/degradation, and liberty/oppression (Haidt/Graham 2007). MFT research consistently shows that individuals and groups differ substantially in how they weight these dimensions, and that this variation is psychologically real and cross-culturally robust (Bago et al. 2022). For the IBF, the key implication is that such differences represent a form of moral diversity — analogous to species diversity in an ecosystem — rather than a hierarchy of moral competence.

Important caveat: Haidt's model has attracted significant methodological and theoretical criticism, including charges of political bias in item construction and insufficient cross-cultural validation (Suhler/Churchland 2011). The IBF draws on MFT's six dimensions solely as an illustrative taxonomy of ethical voices. It does not endorse MFT's broader evolutionary or political claims,

and it remains open to alternative taxonomies as the empirical literature develops.

2.5 Dialogue with Existing Plural-Self Models

The IBF does not emerge in a theoretical vacuum. Two established frameworks — Internal Family Systems (IFS) (Schwartz 1995) and Dialogical Self Theory (DST) (Hermans/Kempen 1993) — already posit that the self is constituted by multiple internal voices or parts.

Richard Schwartz’s IFS model treats internal “parts” as wounded figures that require therapeutic healing; the goal is integration under a healthy “Self.” Hubert Hermans’ DST conceptualises the self as a dynamic multiplicity of “I-positions” in dialogical exchange, drawing on Bakhtin’s literary theory of the polyphonic novel. Both frameworks acknowledge internal plurality and have generated rich empirical research programmes.

The IBF’s distinctive contribution is threefold. First, where IFS positions internal parts as clinical objects requiring repair, the IBF treats ethical voices as ecologically functional — each occupying a niche and contributing to system resilience. The orientation shifts from therapy to cultivation. Second, where DST’s I-positions encompass the full range of self-representation (including cultural, social, and narrative identities), the IBF restricts its focus to ethical voices specifically, enabling targeted educational application. Third, the IBF introduces ecological concepts — niche, symbiosis, endemism, succession, resilience — that generate specific, testable hypotheses about the functional consequences of ethical voice diversity (see Section 7.2). This conceptual precision distinguishes the IBF as a contribution to ethics education rather than to psychotherapy.

2.6 Contributions of Eastern and Ancient Traditions

While the Western academic tradition tends to treat conscience as an individual and rational structure, Eastern and ancient traditions approach it within a collective, relational, and holistic framework. The IBF explicitly integrates these perspectives, treating them not as exotic supplements but as substantive theoretical resources.

Ibn Miskawayh's *Tahdhib al-Akhlaq* (10th century CE): The great Islamic philosopher of character ethics presents the inner balance of virtues as a practical capacity that can be developed through sustained educational practice — directly anticipating the IBF concepts of “succession” (the maturation of the ethical ecosystem over time) and “conscious cultivation” (Ibn Miskawayh 2002). His insistence that character is the product of habit and education, not innate endowment, resonates with contemporary educational philosophy.

Confucius' concept of *ren* (仁): Translated as “humanity” or “benevolence,” *ren* functions not merely as an individual virtue but as a relational capacity that acquires its meaning in the quality of one's relationships and social roles (Chan 1955). In the IBF's terms, *ren* can be understood as the voice of relational ethics — a voice that is systematically suppressed in institutional contexts dominated by procedural justice and rule-compliance.

2.7 Botanical Metaphor: Justification and Limitations

The choice of botanical/biodiversity language requires explicit justification. Three points clarify this methodological selection and address the shift from organism metaphor (Sections 2.1) to ecosystem metaphor (Section 2.7 onwards):

1) Pedagogical Accessibility: Unlike abstract models of the Unconscious, botanical framing generates direct classroom application. Students can map their ethical ecosystem concretely (deep-rooted values, rapid-growth impulses, dormant perspectives), enabling embodied learning. The 19th-century tradition (Nietzsche, Hartmann, Ribot) emphasised internal coordination and multiplicity of forces; the ecosystem metaphor extends this by providing a language of coexistence, niche differentiation, and symbiosis that better serves educational purposes. Both organism and ecosystem models recognise internal plurality and coordination; the ecosystem framework offers particular advantages for ethics education because it avoids the implication of developmental stages (which might suggest transcendence of earlier moral capacities) and instead emphasises the simultaneous presence and coordinated activity of multiple ethical voices. The shift to ecosystem

language enables the IBF's core pedagogical claim: ethical maturity consists not in graduating beyond earlier moral capacities but in coordinating all voices—new and established—toward integrated response.

2) Preservation of Difference: The model does not collapse category boundaries between plant, animal, and human consciousness. Rather, it identifies shared structural principles of dynamic coordination across living systems—what Roux identified as interaction of diverse forces requiring coordination. The organism metaphor emphasises internal struggle; the ecosystem metaphor emphasises coexistence. Both are valid; the IBF privileges the latter for educational purposes because it better captures the goal of ethical development without elimination.

3) Acknowledged Limitations: The botanical metaphor does not explain logic, reasoning, or cognition—these remain irreducible to ecological processes. The framework illuminates only emotional-ethical polyphony and mechanisms of value coexistence within personality. Nor should the ecosystem metaphor be read as collapsing the distinction between biological and ethical/psychological processes — it is a heuristic tool, not a reduction.

2.7.1 Wilhelm Roux and the Organism as Internal Combat: Development Without Competitive Elimination

Wilhelm Roux, one of the founders of modern experimental embryology, built his account of the organism around the "combat of parts" (*Der Kampf der Teile im Organismus*). For Roux, both development and mature function depend on internal struggle: organic elements compete for resources and functional dominance, and for survival within the living whole. In his theory, competitive elimination is not a by-product but a mechanism of development. Parts that lose this internal competition atrophy and become rudimentary, while the parts that win persist and grow. His principle of "functional adaptation" follows directly: tissues develop in response to functional demands, and unused capacities degenerate through disuse and competitive loss.

Roux's framework shares with Nietzsche and Hartmann an essential insight: the organism is NOT monolithic but constitutively plural and internally

dynamic. However, Roux's model makes competitive elimination STRUCTURAL — a necessary feature, not an incidental outcome. Mature organismic form is precisely the result of some parts winning and others atrophying. This differs fundamentally from the IBF's ecological framework.

The IBF draws on Roux's core insight (internal plurality + dynamic coordination) whilst explicitly rejecting his conclusion that maturation requires elimination. In ecological terms: an ecosystem's maturity does not depend on species extinction; rather, mature ecosystems maintain maximum diversity precisely because all species continue to occupy their ecological niches. Applied to conscience, this means that ethical maturation does NOT proceed through the competitive elimination of earlier moral voices (as Roux's model might suggest). Instead, a mature ethical consciousness is one in which all voices remain active, contextually activated according to situational demands, and dynamically coordinated without requiring any voice to atrophy or be rendered obsolete.

In the internal ecosystem of conscience, earlier ethical voices (shame, loyalty, basic care responses) may be less frequently activated in abstract deliberation but remain present and available for full recruitment under conditions where they are contextually appropriate. A student may develop more sophisticated ethical frameworks without losing access to simpler, more emotionally immediate ethical responses; the goal is integration through orchestration, not maturation through elimination.

In pedagogical terms, this distinction is decisive. A Roux-inspired approach would structure ethics education as a developmental sequence in which earlier, simpler moral frameworks progressively give way to later, more complex ones through competitive replacement — the stronger ethical voice gradually displacing and eliminating the weaker. Classical stage-based moral development (Piaget, Kohlberg) reflects this assumption: progress means advancing beyond conventional morality toward post-conventional reasoning; the old stages are transcended and left behind. By contrast, the IBF's biodiversity approach treats the mature ethical self as a system where all voices remain present and active simultaneously, coordinated but not ranked hierarchically or eliminated through development. A student may

mature in ethical sophistication without losing access to earlier voices; rather, they develop the capacity to coordinate all voices more effectively. For this reason, the biodiversity metaphor better captures the IBF's core claim that ethical maturity consists not in graduating to a "higher" moral stage (and thereby rendering earlier stages obsolete) but in cultivating the capacity to hold multiple voices in dynamic coordination, allowing each its full voice whilst orchestrating them toward integrated ethical response.

3. Borrowing the Language of Biodiversity: Ethical Metaphors and Their Limits

3.1 Glossary of Core Metaphors

Reading guide: The following table summarises the principal biodiversity concepts employed in this article and their counterparts in the internal ecosystem of conscience. Each metaphor functions as an explanatory and heuristic tool. None implies evolutionary necessity, biological determinism, or normative equivalence of all ethical voices. The table is followed by fuller elaboration of each concept.

Ecological concept	Counterpart in conscience	Higher education example
Species diversity	Different ethical voices coexisting	A medical ethics seminar surfaces voices of care, justice, autonomy, and professional loyalty simultaneously.
Habitat	The context that activates a particular voice	Justice-voice dominates in academic integrity proceedings; care-voice in student pastoral support.
Ecological niche	The functional role of a voice in ethical reasoning	The loyalty-voice preserves institutional trust; the freedom-voice protects academic enquiry.
Symbiosis	Productive cooperation between voices	Compassion + justice → restorative academic misconduct processes.

Ecological concept	Counterpart in conscience	Higher education example
Endemism	Person-specific ethical sensitivities	A first-generation student's acute awareness of social inequality constitutes an endemic ethical voice.
Succession	Maturation of the ethical ecosystem over time	Graduate students transition from rule-following (heteronomous) to principled judgement (autonomous) ethics.
Ethical resilience	Capacity to recover integrity after moral stress	A lecturer recovers from institutional pressure to inflate grades by drawing on multiple ethical voices.
Consilience	Creative integration of conflicting voices	A research ethics committee that balances scientific freedom, participant safety, and public benefit.

3.2 Species Diversity, Habitat, and Ecological Niche

The internal ecosystem of conscience contains different ethical voices: compassion, justice, loyalty, freedom, responsibility, shame, pride, gratitude, and disgust, among others. Each voice represents a distinct ethical orientation (Haidt/Graham 2007) and becomes more active in its appropriate habitat — the contextual situation that calls it forth. In higher education, this contextual activation is especially visible: the voice of academic freedom is most alive in debates over curriculum or research priorities; the voice of care is most prominent in student welfare decisions; the voice of justice is most salient in assessment and appeals processes. Each voice occupies an ecological niche — a specific functional role within the ecosystem that would be impoverished by its absence. An institution that silences the voice of care in favour of procedural justice alone will produce graduates with formidable analytical skills but impoverished relational ethics.

3.3 Symbiosis, Endemism, and Succession

In nature, symbiosis describes a mutually beneficial coexistence of different species, each providing conditions for the other's flourishing. The voices within conscience can enter into similar relationships. While compassion and

justice may initially appear to conflict — mercy versus accountability — their creative interaction generates more sophisticated ethical responses, such as restorative justice practices that are becoming increasingly influential in higher education discipline systems (Karp 2019). Compassionate justice is not a compromise that dilutes both; it is a symbiotic hybrid that exceeds either alone.

Endemism — the presence of species found nowhere else — points to the irreplaceable individuality of each ethical ecosystem. Every person possesses ethical sensitivities shaped by their unique history: a first-generation university student’s acute awareness of structural inequality, a refugee scholar’s heightened sense of precarity and solidarity, a mature student’s professionally-formed sense of duty — these are the endemic ethical voices of their ecosystems, valuable precisely because they cannot be standardised away. Diversity-aware ethics pedagogy in higher education can actively cultivate these endemic voices rather than suppressing them in favour of a uniform “professional” ethical register.

Succession — the maturation of an ecosystem through predictable developmental stages — maps naturally onto the developmental theories of Piaget and Kohlberg. Conscience does not spring fully formed; it matures through stages of increasing complexity and integration. The IBF adds to this classical picture by suggesting that the goal of succession is not a single dominant voice but a rich, integrated ecosystem of voices — a pluralism that is structured rather than anarchic, diverse rather than relativistic.

3.4 Limits of the Biodiversity Metaphor

A rigorous conceptual framework must be transparent about where its metaphors break down. Three principal disjunctions between biological and ethical ecosystems require explicit acknowledgement:

Evolution versus agency: Biological species evolve through natural selection operating on random variation over geological timescales; the internal ecosystem of a human being can be transformed through conscious choice, deliberate practice, and education within a single lifetime. This is a crucial

disanalogy: the IBF's educational programme is premised on the agency of students and practitioners, not on passive ecological drift.

Value neutrality versus ethical hierarchy: In ecology, all species have equal biological standing. In conscience, some ethical voices carry greater weight than others. Respect for human dignity, non-maleficence, and the prohibition on treating persons merely as means are not mere preferences to be balanced against competing voices; they are what Rawls (1993) calls overlapping consensus principles that anchor every legitimate ethical framework. The IBF is not ethically relativist: diversity of ethical voices is valued instrumentally, for the resilience and wisdom it generates, not intrinsically, as though all ethical positions were equally valid.

External versus internal collapse: A biological ecosystem collapses primarily under external pressure (habitat destruction, climate change, invasive species). The internal ecosystem of conscience can be eroded by internal dynamics — repression, dissociation, trauma, and the defence mechanisms that silence uncomfortable voices. This internal dimension requires therapeutic as well as educational intervention.

4. Why Ethical Diversity Matters: Functional Benefits of a Polyphonic Conscience

4.1 Ethical Resilience and Burnout Prevention

Main claim: Ethical resilience is not passive endurance but the active capacity to maintain moral integrity, recover from moral distress, and learn from ethical challenge — a capacity that may be enhanced by internal ethical diversity.

Cynda Rushton's landmark work on moral resilience in healthcare documented that practitioners with a richer repertoire of ethical frameworks experience significantly less moral distress and burnout than those operating from a single ethical voice (Rushton 2018). Moral distress — the suffering that results from being unable to act in accordance with one's ethical convictions — is endemic in professions shaped by institutional constraints,

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time pressure, and conflicting obligations. Higher education staff and students are not immune: academic integrity dilemmas, research ethics conflicts, and the pressure to conform to institutional cultures can all generate moral distress. The IBF proposes that a more diversified internal ethical ecosystem may buffer this distress: when one ethical voice is blocked or overwhelmed, others can keep moral functioning going. The parallel is ecological redundancy, where several species perform overlapping roles and the system stays stable even when one is under stress. This is a hypothesis, and testing it empirically is a priority for future work.

For higher education, ethics education that cultivates a range of ethical voices — rather than training students in a single theoretical framework — may be better positioned to produce graduates who can sustain ethical practice under real-world pressure. Professional ethics curricula in medicine, law, and business have begun to move in this direction; the IBF offers a conceptual rationale for extending this approach across higher education more broadly, pending empirical validation of its core functional claims.

4.2 Creativity and Consilience

E. O. Wilson (1998) defined consilience as the linking together of different branches of knowledge into a unified explanatory framework. In ethical life, the analogue is the creative integration of competing ethical voices into a response that neither silences any voice nor is paralysed by their conflict. Consider a university research ethics committee weighing the scientific value of a dual-use study against participant risk, institutional reputation, and public benefit: the committee that can genuinely hear all these voices — scientific freedom, care, justice, and social responsibility — is more likely to reach a decision that is both practically wise and morally defensible than one in which a single voice (say, procedural risk-minimisation) dominates. Ethical consilience is not relativist compromise; it is the disciplined integration of legitimate ethical claims. This capacity can be developed at three levels: individual (personal reflection and dilemmatic enquiry), relational (team-based ethical deliberation), and institutional (governance structures that formally represent multiple ethical perspectives).

4.3 The Nocebo Effect and Ethical Self-Efficacy

Main claim: Negative ethical expectations — the belief that one cannot act morally — become self-fulfilling prophecies through mechanisms homologous to the nocebo effect; ethical voice diversity breaks this cycle.

The nocebo effect — the harmful consequences of negative expectations — has well-established neurobiological foundations: negative expectations activate the hypothalamic-pituitary-adrenal axis and suppress immune function through pathways distinct from those involved in the placebo effect (Benedetti 2013; Colloca/Benedetti 2005). The IBF proposes an ethical analogue: a conscience locked into a single, often negative or paralysing voice (“I cannot do the right thing in this institutional context”) generates an ethical nocebo effect in which moral inaction becomes a self-fulfilling prophecy. The phenomenon is well-documented in educational research as a component of ethical disengagement (Bandura 1999): students who believe that “the system” makes ethical action impossible stop attempting to act ethically, and their disengagement confirms their belief. A polyphonic conscience, by contrast, provides multiple points of ethical agency: even when one voice is blocked, others can identify available pathways to moral action, sustaining ethical self-efficacy.

4.4 Ethical Pluralism and the Charge of Relativism

The IBF’s defence against ethical relativism rests on three arguments. First, the ecological metaphor itself distinguishes between species diversity (valued) and the absence of keystone species (harmful). In every healthy ecosystem, some species are foundational: their removal triggers collapse. Similarly, the IBF posits keystone ethical voices — respect for human dignity, the prohibition on treating persons merely as means, non-indifference to suffering. These voices are keystone not because of intuitive appeal but because they are recognised across independent ethical traditions (deontological, consequentialist, virtue-ethical, care-ethical, and others) as prerequisite to any coherent moral system. Following Immanuel Kant and contemporary accounts of human rights, respect for dignity and the prohibition on treating persons merely as means function as constraints that

any legitimate ethical framework must respect (Kant 1785; Rawls 1971). Their suppression is not a form of ethical diversity but a violation of the normative foundations on which pluralism itself rests.

Second, John Rawls’ concept of “overlapping consensus” provides a procedural resolution: different ethical traditions converge on a common core of basic principles even while diverging on their theoretical foundations and their specification of these principles in particular contexts (Rawls 1993). The IBF does not require that all ethical voices be treated as equally valid; it requires that they be genuinely heard before being weighed and, where appropriate, overridden by these foundational constraints.

Third, diversity and universality are not opposites. As Wilson observed in a different context, biological diversity is sustained by universal ecological laws; ethical diversity is sustained by universal principles of human dignity that make pluralism possible in the first place. The IBF’s aspiration is a structured pluralism: a community of ethical voices that is diverse but not anarchic, inclusive but not indiscriminate.

5. Imbalances and Threats: The Loss of Ethical Biodiversity

5.1 Ethical Monoculture and Institutional Pressure

A conscience dominated by a single ethical voice — ethical monoculture — is less resilient, less creative, and more vulnerable to catastrophic failure than a diverse ethical ecosystem. In higher education, institutional cultures can inadvertently cultivate ethical monocultures: overemphasis on metrics and audit cultures may systematically privilege the voice of procedural compliance at the expense of care, professional solidarity, and academic freedom (Shore/Wright 2000). The result is not ethical clarity but ethical fragility: when the dominant voice is disrupted — by a genuine dilemma, an institutional crisis, or personal moral distress — the institution or individual has no alternative ethical resources to draw on.

Travis Hirschi's Social Bond Theory provides a complementary perspective: when individuals' bonds to community, commitment to shared goals, and belief in legitimate norms are weakened, they become more susceptible to "invasive" ethical voices from external sources — ideological, commercial, or institutional pressures that colonise the ethical vacuum (Hirschi 1969). Totalitarian ideologies and destructive group dynamics exploit precisely this mechanism, suppressing internal ethical diversity to make compliant actors. Higher education institutions that actively cultivate ethical voice diversity in their students and staff are not merely enriching individual moral lives; they are building institutional resistance to ethical capture.

5.2 Trauma, Epigenetics, and the Suppression of Ethical Voices

Significant life trauma can silence ethical voices through neurobiological and psychological mechanisms. Teicher and Samson (2016) documented the enduring neurobiological effects of childhood adversity on prefrontal cortical development — precisely the neural systems most associated with complex moral reasoning. Recent epigenetic research demonstrates that early-life stress is associated with altered DNA methylation patterns that affect emotional regulation and cognitive flexibility across the lifespan (Sumner et al. 2022). For higher education institutions, which serve increasingly diverse student populations including those with histories of adversity, this research underlines the importance of psychologically safe learning environments as prerequisites for ethical development.

Aldo Leopold's concept of an ecological conscience — the extension of ethical concern to the land community — offers a further dimension (Leopold 1949). The IBF suggests that individuals who are disconnected from natural environments, or who are overwhelmed by ecological anxiety, may experience a corresponding impoverishment of their inner ethical ecosystem: the voice of ecological responsibility is suppressed by helplessness, and the resulting moral disengagement compounds the crisis. Reconnecting students to natural environments — through environmental ethics curricula, field-based learning, and campus sustainability practices — may therefore have effects on ethical development that extend well beyond environmental concern.

6. Fields of Application in Higher Education, Psychology, and Leadership

6.1 Higher Education Pedagogy

Urie Bronfenbrenner’s ecological systems theory (Bronfenbrenner 1979) and Paulo Freire’s pedagogy of conscientisation (Freire 1970) provide the dual educational foundation for the IBF’s pedagogical applications. Bronfenbrenner reminds us that ethical development occurs within nested ecological contexts — classroom, institution, community, culture — none of which can be treated in isolation. Freire reminds us that genuine ethical education requires the problematisation of received norms, not their passive transmission. Together, they support a pedagogy that is contextually sensitive and critically reflexive. The following tools have been developed from the IBF to operationalise these principles:

Ethical Voice Diary: A structured daily reflection tool in which students record, at the end of each day, which ethical voice was most active, which was most suppressed, and what decision they faced. Over a semester, these diaries generate rich personal data about habitual voice patterns and contextual triggers. Educators can use anonymised diary themes as the basis for seminar discussion, connecting individual experience to theoretical frameworks.

Ethical Ecosystem Map: A visual mapping exercise in which students represent their internal ethical ecosystem as a metaphorical landscape — a “inner rainforest.” Strong voices appear as large trees; weak or suppressed voices as seedlings or shadows. The exercise surfaces implicit ethical priorities that formal debate often conceals, and creates a basis for structured reflection on voice imbalance. In diverse cohorts, sharing maps generates productive recognition of ethical endemism — the unique voices that different students bring.

Dilemma Studio: A structured deliberative format in which each participant is assigned a different ethical voice (care, justice, loyalty, freedom, sanctity)

and must argue from that voice's perspective on a real institutional dilemma. The studio format — modelled on design studio critique — creates conditions for genuine consilience: participants must listen to voices they do not habitually occupy, and the group must produce an integrated response that takes all voices seriously.

Ethics Biography: Students construct a narrative account of their ethical development — identifying formative experiences, voice acquisitions, and voice suppressions — informed by the succession metaphor. This biographical approach, consistent with narrative ethics pedagogy (Nelson 2001), connects theoretical frameworks to lived experience and supports identity formation as an ethical practitioner.

These tools are designed to be modular: they can be integrated into existing ethics courses, professional placement programmes, or leadership development seminars without requiring a complete curriculum redesign. Facilitator guidance for each tool is under development and will be shared in subsequent publications.

6.2 Psychology and Coaching

The IBF's ecological orientation translates naturally into coaching and psychological practice. The following protocols have been developed for use with individual clients and coaching groups:

Internal Ecosystem Assessment Interview: A semi-structured interview protocol that maps dominant, recessive, and suppressed ethical voices. The practitioner asks: “Which of your ethical voices have you heard most often in the last six months? Which has spoken hardly at all? What might the suppressed voice want to say?” This interview generates a personal ethical ecosystem profile that can guide subsequent coaching work.

Dominant Species Test: An ethical voice profile instrument, currently under development (see Section 7.2), that assesses the relative weight of ethical voices across the six MFT dimensions and beyond. The profile allows clients to see their own ethical “species distribution” and to identify potential sources of resilience and vulnerability.

Body–Conscience Integration: A practice sequence that develops somatic ethical awareness through interoceptive exercises. Drawing on Garfinkel and Critchley’s (2013) evidence that interoceptive accuracy is foundational to emotion regulation and self-awareness, these exercises help clients recognise the bodily correlates of different ethical voices — enabling more rapid and reliable access to ethical intuition under pressure.

6.3 Academic Leadership and Consilience Governance

Academic leaders — heads of department, deans, senior managers — operate in environments of sustained ethical complexity: resource allocation, personnel decisions, curriculum policy, and public accountability all generate simultaneous ethical demands. The IBF offers two leadership-specific protocols:

Ethical Diversity Audit: A structured organisational assessment that examines which ethical voices have been systematically represented — or excluded — in an institution’s decision-making processes over a defined period. The audit generates an institutional “ecosystem map” analogous to the individual map described in Section 6.1, identifying monoculture risks and potential endemism resources.

Orchestra Conductor Protocol: A decision-making discipline in which the leader systematically asks, before every significant decision, five structured questions corresponding to five ethical voices: (1) Who might be harmed and how? (Care) (2) Who bears the costs and who the benefits, and is this fair? (Justice) (3) What does this decision signal about our institutional commitments? (Loyalty) (4) Does this protect or constrain the freedom of individuals? (Liberty) (5) Does this accord with our deepest values as an academic community? (Sanctity/Integrity) This protocol structurally prevents single-voice decision-making and leaves a documented record of multi-voice deliberation.

6.4 An Eight-Week IBF Implementation Programme: Draft Outline

The following table outlines a provisional eight-week programme for applying the IBF in higher education ethics courses, leadership development

seminars, or coaching cohorts. Each week focuses on one core component of the framework. The programme is designed to be iterative: later weeks build on the insight and materials generated in earlier ones.

Week	Focus	Core concept	Sample activity
1	Mapping the ecosystem	Species diversity	Complete an Ethical Ecosystem Map. Identify three dominant and one suppressed voice.
2	Context and activation	Habitat sensitivity	Ethical Voice Diary. Track which voice dominates at work, in personal life, and under stress.
3	Productive conflict	Symbiosis	Dilemma Studio with a real institutional case. Identify one compassion–justice symbiosis.
4	Unique sensitivities	Endemism	Ethics Biography extract. Identify one ethical voice that is personally endemic.
5	Change over time	Succession	Reflective essay: “How has my ethical ecosystem changed in the last five years, and why?”
6	Recovery capacity	Ethical resilience	Design a personal “moral recovery protocol” for use in ethical distress situations.
7	Integrating conflict	Consilience	Real-life dilemma: formulate a response that takes two competing voices equally seriously.
8	Leadership application	Consilience governance	Apply the Orchestra Conductor Protocol to a departmental or institutional decision.

This programme outline is a starting point; detailed session protocols, facilitator guides, and assessment rubrics are under development and will be presented in subsequent publications. The programme has been piloted informally in coaching contexts; formal educational evaluation is planned as part of the future research agenda described in Section 7.2.

7. Conclusion: The Internal Biodiversity Framework

7.1 Summary and Conceptual Model

This article has reconceptualised the polyphonic structure of conscience through the metaphor of ecological biodiversity, introducing the Internal Biodiversity Framework (IBF) as a novel theoretical contribution to ethics education in higher education. The IBF proposes that conscience functions as an internal ecosystem in which different ethical voices coexist, compete, and cooperate. Eight core concepts structure the framework:

Species diversity – the plurality of ethical voices (compassion, justice, loyalty, freedom, responsibility, and others) as the basic resource of moral life.

Habitat – the contextual situations that activate particular voices.

Ecological niche – the functional role that each voice performs within the ecosystem.

Symbiosis – the productive relationships between voices that generate more sophisticated ethical responses.

Endemism – the person-specific ethical sensitivities that constitute irreplaceable moral resources.

Succession – the developmental maturation of the ethical ecosystem over time.

Ethical resilience – the active capacity to maintain integrity, recover from moral distress, and learn from ethical challenge.

Consilience – the creative integration of conflicting voices into responses that are wiser than any single voice could produce.

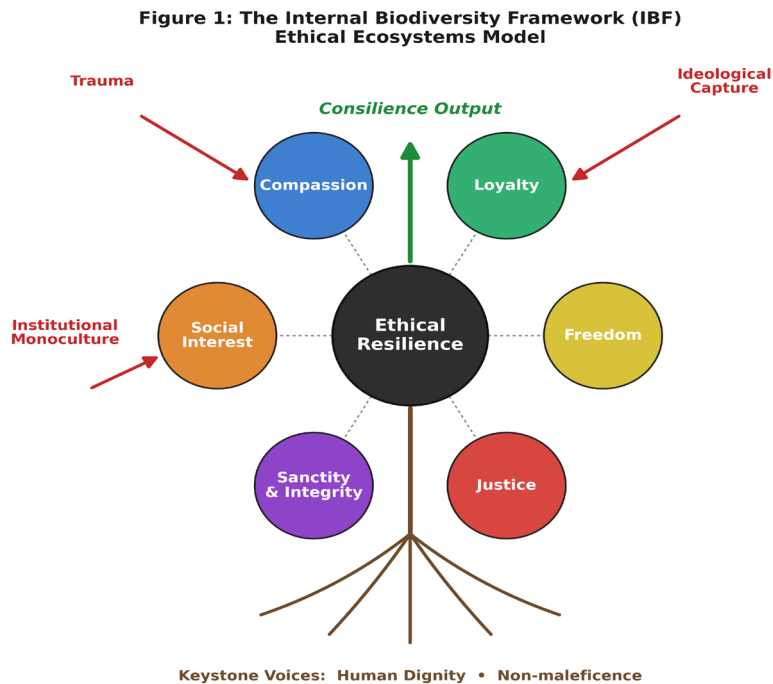


Figure 1: The Internal Biodiversity Framework (IBF) – Ethical Ecosystems Model.

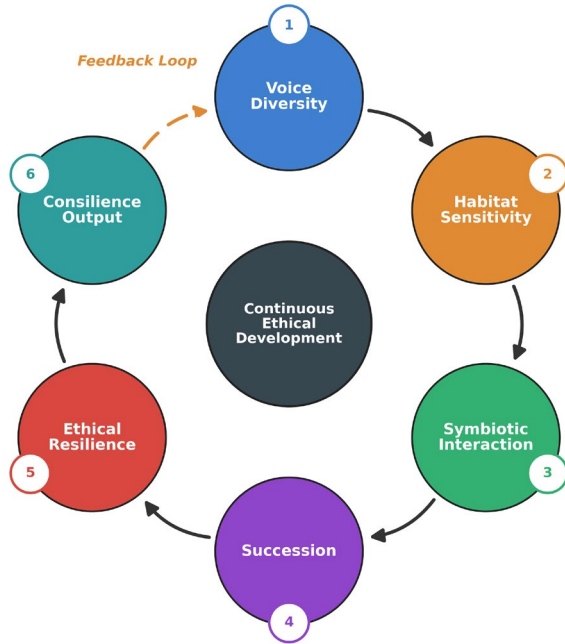


Figure 2: IBF Component Flow – From Diversity to Consilience.

Theoretical positioning: The IBF differs from Kohlberg’s unilinear stage model by treating ethical plurality as the mature condition rather than a transitional imperfection. It differs from Rawls’ rational universalism by grounding ethical reasoning in a richer, more contextually sensitive set of voices. It differs from Freud’s conflictual superego model by treating internal ethical tension as functional rather than pathological. It distinguishes itself from IFS by emphasising ecological cultivation over therapeutic repair, and from Dialogical Self Theory by focusing specifically on ethical voices and generating targeted educational applications. These distinctions position the IBF as an original contribution to the fields of moral psychology, ethics education, and academic leadership development.

7.2 Future Research Agenda

The IBF is presented here at the conceptual-theoretical level. Its translation into empirical research requires, first, the development of valid and reliable

measurement instruments, and second, the design and execution of studies that test its core claims. Two primary hypotheses are proposed for initial empirical investigation:

H1: Individuals who score higher on ethical voice diversity (as measured by a future IBF-based Ethical Pluralism Scale) will report significantly lower levels of moral distress and ethical burnout on validated instruments (e.g., Corley et al.'s Moral Distress Scale, Rushton's Moral Resilience Scale).

H2: Individuals with documented histories of significant adversity will show more restricted ethical voice profiles (monoculture patterns) compared to control groups, with effect sizes moderated by the presence of therapeutic or educational interventions.

A draft Ethical Pluralism Scale (EPS) is under development. Items are designed to assess both the breadth of ethical voice repertoire and the flexibility of contextual activation. Indicative items (five-point Likert format) include:

- “When facing a difficult decision, I can easily consider multiple ethical perspectives (e.g., compassion, justice, loyalty).”
- “I am aware that different situations (work, family, solitude) activate different ethical values in me.”
- “I actively try to integrate competing ethical values (such as justice and compassion) rather than choosing one.”
- “My conscience has changed significantly over the course of my adult life.”
- “I feel that suppressing an ethical voice (e.g., compassion for the sake of rules) reduces my overall moral confidence.”

A pilot validation study combining the EPS with an established ethical dilemma battery (target $n = 60\text{--}100$) is planned. The full instrument, together with detailed facilitator guides for the educational tools described in Section 6, will be presented in subsequent publications. Researchers interested in collaboration on instrument development or programme evaluation are invited to contact the author.

As John Ruskin once observed: “There are many religions, but there is only one morality” (Ruskin 1853). This article has attempted to show that the unity Ruskin sought need not require uniformity. Conscience at its most developed is not a silent, singular, immutable judge sitting above the noise of ethical life: it is a living, breathing, growing ecosystem — diverse in its voices, resilient in its structure, and capable of integration that wisdom traditions across the world have always known by other names. For higher education, which bears a distinctive responsibility for the moral formation of the next generation of professionals and leaders, this ecological vision of conscience offers both a compelling ideal and a practical programme of action.

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9. Short biography

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Challenges of Student Mothers in Higher Education

A Narrative Literature Review
of Sub-Saharan Africa Context

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Keywords

Student mothers, higher education, Sub-Saharan Africa, academic challenges, financial challenges, social challenges

Abstract

Student mothers pursuing higher education face multiple challenges, including in Sub Saharan Africa (SSA). Despite the challenges they encounter, limited comprehensive review has been done on academic, social and economic challenges they experience while pursuing their studies in higher education in SSA. This study was guided by Role Strain Theory and the Ethic or Care Theory. It reviewed 21 empirical studies published between 2013 to 2025 from Kenya, Uganda, South Africa, Namibia, Ghana, Nigeria, and Tanzania. The findings indicates that the challenges facing student's mothers are interconnected. First, academic challenges including limited concentrations in classroom and limited time, which can lead to poor academic performance. Second, financial challenges include cost of childcare. Finally, social challenges include isolation and stigmatization. The findings support role strain theory, as evidenced by participants' experiences of overload, due to time constraints, and multiple responsibilities related to academic work and child caring. The findings also align with the ethic of care theory which call institutions support. The study recommends special consideration, flexibility and financial support as well as providing facilities for student's mothers to enable them to complete their study. This is necessarily due to their unique need, to ensure equity and good education outcomes.

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1. Introduction

Globally, quite a good number of universities are increasingly recognizing women's right to enroll and continue their studies during pregnancy and motherhood. Basically, they acknowledge that, higher education students are adults exercising their fundamental human rights (Abd Majid et al., 2019; Chinkondenji, 2025; N-yelbi, 2024). Recognizing this, many countries, including in Sub Saharan Africa (SSA), allow women to access higher education regardless of their status (Ashipala & Natanael, 2022; Fute & Wan, 2021; Ogunji et al., 2020). This opportunity enables student mothers to become future mothers through educational advancement. However, despite this opportunity literature document between recognition and reality (Opit et al., 2020).

While motherhood should not constitute a barrier to educational advancement, the practical challenges of managing dual responsibilities of academic pursuits and childcare, present substantial obstacles that significantly impact student mothers' educational outcomes and the overall well-being. Patently, the SSA context presents unique challenges for student mothers because; in many African societies, childcare is predominantly considered a maternal responsibility (Bukhosini, 2019). Largely, the existing literature from SSA reveals the multifaceted nature of challenges facing student mothers in higher education.

Although some countries such as South Africa report that most student mothers at the University of KwaZulu-Natal receive financial aid (Bukhosini, 2019) patently, the majority of student mothers have limited academic, economic, social or institutional support systems (Opit et al., 2020). Therefore, this situation contrasts sharply with the developments in higher-income countries where targeted support programs have been implemented. For example, in the US, the Child Care Access Means Parents in School (CCAMPIS) program supported approximately 3,300 student mothers on childcare costs for about 4,000 children during the 2016-2017 academic year (Emrey-Arras, 2019). In SSA, however, the literature reveals a markedly different landscape characterized by

inadequate institutional support and fragmented services for student mothers who are in Higher Education Institutions (HEIs).

Studies from Nigeria for example, point a critical gap in the availability and accessibility of childcare (Ogunji et al., 2020). In Ghana evidence shows serious challenges in classroom concentration, persistence fatigue and lack of essential facilities such as lactation rooms (Adofo, 2013; Amos et al., 2021; Dankyi et al., 2019). Similarly, research from Namibia, indicates a direct link between nursing motherhood and academic performance (Ashipala & Natanael, 2022). In essence, evidence consistently indicates that, student mothers face serious academic consequences, including poor examination performance, supplementary examinations, delayed degree completion, increased dropout rates and social isolation (Baluyos & Alvarico, 2024; Gospel-Tony et al., 2018; Kigen et al., 2022; Munyua et al., 2022; Ogunji et al., 2020; Rhone, 2023; Thompson-Miller, 2023).

For instance, Lugulu (2015) in Kenya reported that, motherhood significantly affected students' academic progress as 37% of them sat for supplementary examinations and 23% deferred studies while others repeated courses or were discontinued. Despite these documented struggles, the majority of student mothers continue striving to achieve their academic goals (Anibijuwon & Esimai, 2020; Torres et al., 2020), while being held to the same demanding academic standards as all other students (N-yelbi, 2024).

The literature presents divergent perspectives on addressing this issue. While some scholars argue for delayed childbearing until degree completion due to the complexity of managing multiple roles (Bogi et al., 2023), others advocate for robust institutional support mechanisms. Principally, they emphasize that motherhood is a natural biological process that should not preclude educational advancement (Anibijuwon & Esimai, 2020; Torres et al., 2020; Sativa, 2025) and that, student mothers require unique attention and additional support (Cranney, 2025). Essentially, some student mothers view childbearing during their studies as exercising their reproductive rights while efficiently managing

life stages, while others argue that it secures their children's futures (Fatima et al., 2025; Maisela & Ross, 2018). However, institutional responses remain inadequate, since, quite a good number, have policies that allow pregnancy and childbearing but provide no specific support in reality, leaving the burden to fall entirely on student mothers (Fulton, 2023; Kisanga & Matiba, 2023; Madinah et al., 2021).

Despite the increasing awareness of the challenges faced by student mothers in HEIs, significant gaps remain in the existing literature. First, while research focusing on country specific are available (See Kakuru, 2021 in; Naidoo et al., 2021 in South Africa), there is clear lack of comprehensive literature review that synthesize these challenges across various countries in SSA. Second, many existing reviews focus on different populations, such as teenage or adolescent mothers in primary and secondary education (Kinya & Nzengya, 2025) or use methodologies that concentrate exclusively on adolescents instead of student mothers in HEIs (Kassa et al., 2018). Third, although many studies have documented specific challenges faced by student mothers, such as those by Bogi et al. (2023) in Ghana and Ogunji et al. (2020) in Nigeria—there is limited evidence that comprehensive review these challenges in a holistic and multidimensional way in the context of SSA.

This comprehensive narrative literature review addresses the identified gaps by synthesizing the existing evidence on the multifaceted challenges faced by student mothers pursuing higher education in SSA, contrasting with single-country studies (Morgan et al., 2023, 2025; Mukabana et al., 2024). By adopting a regional approach, this review explores the contexts of HEIs across multiple SSA countries. The main research question focuses on the challenges facing student mothers in SSA. Specifically, this research seeks to answer three key questions based on the existing literature: What academic challenges student mother encounter? What financial obstacles do hinder their progress? And what social challenges do affect their educational experiences?

This review has synthesized geographically scattered studies from SSA, revealing how academic, financial and social challenges intersect.

The review also highlights the urgency of HLIs to respond to the challenges facing student mothers, as well as areas requiring interventions.

The synthesis further informs educational officials and policy makers to consider unique needs of student mothers to foster conducive learning environment.

2. Theoretical Framework

This literature review is guided by two complementary theoretical frameworks: Role Strain Theory (RST) (Goode, 1960) and the Ethics of Care Theory. Together, these frameworks provide a comprehensive lens for analysing the multidimensional challenges facing student mothers in SSA countries.

Role Strain Theory

The Role Strain Theory (RST) serves as the analytical framework for understanding the challenges facing student mothers as they pursue their studies in higher education while caring for their children. According to Goode (1960), individuals experience role strain when they find it difficult to fulfil the demands of a single role due to competing responsibilities. This theory is particularly relevant in the context of student mothers in SSA, where the intersection of educational and maternal roles generates unique challenges.

Student mothers pursuing higher education often encounter significant tension as they strive to meet stringent academic demands. They are expected to attend classes punctually, engage in self-study, complete assignments on time, and care for their infants. The balancing acts required to manage these responsibilities can lead to considerable stress and strain, illustrating the core tenets of RST.

In SSA, resources challenges are particularly acute for student mothers. They may face challenges of getting accommodation, access to lactation rooms and financial constraints related to childcare, issues that their

non-parenting peers typically do face. The financial challenges often arise from the dual demands placed on them, generating increased expenses for childcare and transportation. As such student mothers may struggle to find the time and resources needed to meet academic expectations, further confirming the applicability of RST in this study.

Socially, student mothers often find difficulty balancing a healthy social life, which contributes to their role strain. The time devoted to maternal responsibilities frequently reduced opportunities for peer engagement and academic networking, leading to social isolation. The RST theory is suitable in this study because guide to explain various documented academic challenges faced by student mothers, including concentration difficulties, persistent fatigue, time management issues, and academic performance (Adofo, 2013; Amos et al., 2021; Ashipala & Natanael, 2022; Dankyi et al., 2019) in SS context.

Ethics of Care Theory

The ethic of Care Theory provides a comprehensive framework for understanding the unique challenges faced by student mothers in higher education while pursuing their studies. This theory is based on four key principles: interconnectedness, responsibility, moral descion making, and contextual understanding. These principles underscore the necessity for addressing the unique challenges student mothers while pursuing their studies with motherhood responsibilities.

To effectively support student mothers, educational institutions must develop comprehensive networks that acknowledge their interconnectedness. This principle highlights the relationships and social ties that enhance their experiences in the academia. Compassionate policies designed to address the specific challenges these women face such as flexible learning options, including adjustable course schedules and online programs, can significantly alleviate the burden they carry. By embracing their responsibility as both students and caregivers, institutions can create an empathetic learning environment that fosters

academic success while considering the multifaceted roles student mother play.

Furthermore, establishing mentorship programs is essential for connecting student mothers with role models, thereby cultivating a sense of community and alleviating feelings of isolation. This approach reflects moral decision making by prioritizing the support of student mothers, acknowledging their needs, and providing them with resources to assist them while taking their dual roles. Practical support, such as allowing family members or friends to assist them with childcare during lectures, exams or study sessions, can empower student mothers to thrive academically, ensuring they have the conditions to succeed like peers.

Finally, previous studies such as Miller (2021) on academic motherhood amid the covid 19 pandemic highlight the effectiveness of Ethic of Care Theory in Educational context. This theory's contextual understanding is crucial, as it recognizes that the challenges faced by student mothers cannot be viewed in isolation. Thus, the theory is applicable as it enhances understanding of the educational experiences of student mothers in SSA, ultimately promoting their success and well-being while acknowledging the broader social and economic context they exist.

Methodology

This study employed a narrative literature review approach to critically synthesize existing literature in SSA on challenges faced by student mothers. This methodology was chosen because it facilitated the comprehensive critical synthesis across multiple SSA countries, addressing geographical fragmentation in the existing research. In essence, narrative reviews are particularly effective for exploring multidimensional phenomena such as academic, social and financial challenges that student mothers encounter, while facilitating thematic analysis and critical interpretation of findings that can influence policy and practice,

Literature Search Strategy

Literature search was conducted from relevant studies published between 2013 and 2025 to capture challenges facing student mothers who are pursuing higher education in Sub Saharan African countries. In achieving this strategy, multiple electronic data base was also searched, including AJOAL, DOAJ, ERIC, Google Scholar and institutional repositories from major Sub-Saharan African universities. The search strategy employed a combination of key words and Boolean operators so as to maximize retrieval of relevant literature. The key terms included “student parents”, “teenage mothers”, “student mothers, “and “higher education” combined with geographical identifiers and terms related to challenges. Additional researches included terms like "academic performance," "childcare “and” financial constraints." The reference list of the identified articles was manually searched to locate additional relevant studies.

Inclusion and Exclusion Criteria

The studies included in this narrative review, typically focused on student mothers in HEIs in SSA, uniquely exploring their academic, social and financial challenges they face while pursuing their studies. The review also incorporated studies in English and published between 2013 and 2025. The study included only empirical research methods or solid theoretical analyses. This research excluded all the studies that focused solely on primary or secondary education, those examining adolescent mothers outside HEIs or lacking methodological rigor. Finally, 21 articles from seven countries namely Kenya, Uganda, Tanzania, Ghana, South Africa, Nigeria and Namibia which were screened for relevant and evaluated in detail, meet the inclusion criteria.

Data Extraction and analysis

Data extraction was carried out systematically to ensure consistency and comprehensiveness. Information, extracted for each study included author(s) and year of publications, country and institutional context,

sample characteristics and key findings. In this analysis, the data were organized in a matrix to identify themes across studies. Thematic analysis, following Braun and Clarke approach (2006), was employed to synthesize the findings, progressing through stages of familiarization, coding, theme identification and narrative synthesis. The analysis was guided by RST (1960) and ethics of care theory to inform interpretation.

Ethical Considerations

This literature review which basically analyzed the existing secondary data, did not involve primary data, in this manner not requiring formal ethical approval. However, ethical principles guided the process, to ensure proper citation and respectful presentation of the sensitive information regarding student mothers. Evidently, the review upheld academic honesty, transparency in methodology and responsible scholarship throughout.

3. Data Presentation and Discussion of the Findings

This section presents and discusses the findings from the reviewed literature on the challenges facing student mothers in SSA, analyzed through the theoretical lenses of RST (Goode, 1960) and Ethics of Care Theory. Essentially, data are organized into three major thematic categories namely: Academic Challenges, Financial Challenges and Social Challenges as indicated in Table 4.1.

Table 1: Challenges Facing Student Mothers Based on the Reviewed Literature

Themes	Sub themes	Articles reviewed	Countries
Academic Challenges	Role Conflict and Class Attendance	Maisela and Ross (2018); Musili (2018); Ngunyi et al. (2025); Osuamn et al. (2016); Taukeni	South Africa, Kenya, Ghana, Namibia

Themes	Sub themes	Articles reviewed	Countries
Financial Challenges		(2014	
	Concentration Deficits and Sleep Deprivation	Amos et al. (2021); Ogunji et al. (2020); Osafo (2016))	Ghana, Nigeria
	Academic Performance Impacts:	Esia-Donkoh (2014); Mwangi (2022)	Ghana, Kenya,
	Institutional Inflexibility	Danky et al. (2019); Kakuru (2021); Shange & Maharaj (2025)	Ghana, Uganda, South Africa
	Childcare Costs:	Danky et al. (2019); Kanana et al. (2021); Ngunyi et al. (2025)	Kenya, Ghana,
Social Challenges	Housing and Transportation Expenses	Adofu (2013); Alabi et al. (2025); Bukhosini (2019); Kavishe (2025); Kigen et al. (2022); Kisanga and Matiba (2023); Madinah et al. (2021)	Nigeria Ghana, Tanzania South Africa, Uganda
	Stigma and Social Isolation	Kakuru (2021); Kigen et al. (2022); N-yelbi (2024)	Nigeria, Ghana, Uganda
	Loss of Social Engagement	Esia-Donkoh (2014); N-yelbi (2024)	Ghana
		Bukhosini (2019); Kanana et al. (2021); Maisela & Ross (2018)	South Africa, Kenya

Themes	Sub themes	Articles reviewed	Countries
	Lack of Institutional Infrastructure	Amos et al. (2021); Madinah et al. (2021); Kakuru (2021)	Ghana, Uganda, Nigeria
	Psychological Stress	Amos et al. (2021); Bukhosini (2019); Opit et al. (2020); Taukeni (2014)	South Africa, Ghana, Uganda, Namibia

Academic Challenges

Role Conflict and Class Attendance

Basically, student mothers across SSA reported persistent struggles in balancing their dual roles, leading to frequent class absences a pattern consistent with RST (Goode, 1960) core premise that, individuals with multiple role obligations experience conflict when role demands exceed available resources. In Kenya, Ngunyi et al. (2025) found that, 41% of the student mothers had missed classes after having children, while Musili (2018) documented conflicts arising from juggling childcare, household duties and academic obligations. Similarly, in South Africa, Maisela and Ross (2018, p. 50) quoted a student mother stating, “*It is difficult to balance dual roles since, that is why, I had to miss classes for there was no one to take care of my child.*” Moreover, in Uganda, Madinah et al. (2021, p. 80) reported students traveling long distances and arriving to lectures when they were already in progress, with some lecturers refusing them entry. Likewise, in Ghana, Osuman et al. (2016) reported student-mothers struggling to attend lectures and preparing adequately for exams due to various non-academic commitments. Conversely, Taukeni (2014) in Namibia, found student mothers skipping lectures, further demonstrating the universal nature of RST's predictions.

These findings validate Goode's (1960) assertion that competing role demands create psychological tension and behavioral strain, regardless of the cultural context. When individuals cannot simultaneously meet

the expectations of their various roles, in this case, as students and as mothers, they experience role overload, leading to compromised performance in one or both domains.

To address these challenges, Kisanga and Matiba (2023) in Tanzania, recommended the establishment of special hostels for nursing mothers, allowing them to pursue their studies more smoothly. This suggests that structural interventions can significantly reduce role strain by bringing childcare responsibilities closer to academic obligations.

Furthermore, applying the Ethics of Care Theory emphasizes the importance of promoting empathy and compassion in the educational settings. Recognizing the inherent moral responsibility to support one another can foster an environment where student mothers are better understood and accommodated. By prioritizing the needs of student mothers in a caring context, institutions can help improve their academic experiences and outcomes.

Concentration deficits and Sleep Deprivation

The literature consistently documents how maternal responsibilities, particularly nighttime childcare and breastfeeding, severely impact student mothers' ability to concentrate during lectures. A Nigerian student mother captured this reality that: *"Sometimes I cannot prepare very well for my quiz since my baby sometimes wakes up in the middle of the night and I have to breastfeed him. Sometimes I find myself dosing in the class when a lecture is going on since I do not get enough rest"* (Ogunji et al., 2020, p. 288-289). Besides, in Ghana, Amos et al. (2021, p. 5) reported student mothers stating that, *"Early and late lectures affect my personal engagements with my children and academic work since I am always tried to learn after the day's lectures."* A previous study by Osafo (2016) found a minimum of 71% of student mothers at College of Distance Education of the University of Cape Coast performing laborious non-academic activities daily which posed negative high effects on their academic performance.

These experiences illustrate the concept of resource depletion in RST (Goode, 1960). The physical and cognitive demands of motherhood, particularly through nighttime responsibilities such as breastfeeding and childcare, result in insufficient energy for academic engagement. The theory posits that individuals possess finite resources, such as time, energy, and attention, which must be distributed across various role demands. When one role requires extensive nighttime energy expenditure through childcare and breastfeeding, the cognitive and physical resources available for academic responsibilities become depleted. This resource scarcity leads to what the Role Strain Theory describes as “role strain,” ultimately contributing to concentration deficits and diminished academic capacity.

From the perspective of the Ethics of Care Theory, it is essential to recognize the interconnectedness of student mothers' responsibilities. To effectively support these women, educational institutions should implement flexible learning options that enable student mothers to manage their time more effectively. Offering adaptable course schedules and online learning opportunities can help student mothers balance their academic responsibilities with their caregiving duties. By prioritizing policies that address these challenges, institutions can create an empathetic learning environment that fosters the well-being and academic success of student mothers.

The alignment of the RST and the Ethics of Care Theory underscores the necessity for tailored institutional support, which acknowledges the dual pressures faced by student mothers. By addressing the issues of concentration deficits and sleep deprivation within this dual theoretical framework, we can better understand the challenges student mothers encounter and work toward systemic changes that promote their success and overall well-being.

Academic Performance Impacts

The cumulative effects of role strain are manifested in poor academic outcomes across the region. In Ghana, Esia-Donkoh (2014, p. 31) documented a final-year student mother lamenting, “*My child does not*

allow me to study at all. Sometimes when I have a quiz, she cries all night, preventing me from studying. Last semester for example, I had grade D (50%-54%) in almost all my courses; my worst academic results on campus.”

In Kenya, Mwangi (2022) found that, poor academic performance among student mothers was due to low class attendance, missing continuous assessment tests and incomplete assignments. Besides, in Uganda, a student mother reported that, *“I always fail to meet the academic deadlines especially handing in course assignments in time and attending tutorials and group discussion projects. This is due to failure to manage the limited time available at my disposal”* (Madinah et al., 2021:80). Moreover, in Namibia, the study by Taukeni (2014) found that student mothers often failed some modules and missed the opportunity to sit for initial examinations. Academic challenges facing student mothers have also been reported in Nigeria (Anibijuwon & Esimai, 2020).

These documented performance deficits highlight how role overload produces tangible academic disadvantages, validating RST as posited by Goode (1960). The strain from managing conflicting role expectations profoundly impacts performance, resulting in failing grades, missed deadlines, and unfinished coursework. The theory underscores that individuals juggling multiple roles possess limited resources—time, energy, and focus—which become further depleted when responsibilities clash.

The Ethics of Care Theory also gives valuable insights into these challenges as faced by student mothers. Regarding the culture of empathy and community support, educational institutions can help alleviate some of the burdens student mothers experience. For instance, providing childcare support or allowing for cooperative caregiving arrangements can enable student mothers to better manage their academic responsibilities. Empowering fellow students or family members to assist with childcare responsibilities as well as hiring a baby

assistant, can create the necessary time for attending lectures, completing assignments, and studying effectively.

In this context, institutional policies that promote a caring environment can help mitigate the negative impacts of role strain, ultimately enhancing academic performance. By prioritizing the needs of student mothers and creating supportive structures rooted in the Ethics of Care, academic institutions can substantially improve their educational experiences and outcomes.

Institutional Inflexibility

It was noted in Uganda by Kakuru (2021, p. 740) that a student mothers missed a test due to her baby's illness. Unfortunately, she could not provide the required medical documentation since she lacked money for a doctor's visit, resulting in a zero grade and course failure. Likewise, in Ghana, Danky et al. (2019) documented nursing mothers struggling with night classes and difficulty in understanding topics taught in their absences. Furthermore, in South Africa, a study by Shange and Maharaj (2025) at KwaZulu-Natal reported limited assistance for young mothers at the university.

These instances illustrate the pressing need for educational institutions to adopt more flexible policies that align with the Ethics of Care Theory, which emphasizes empathy and support for individuals in caregiving roles. By implementing compassionate, context-aware interventions, institutions can help mitigate the role strain identified in Goode's (1960) RST, where competing demands on time and resources lead to compromised academic performance. A commitment to caring and responsive educational practices not only fosters a more inclusive environment but also empowers student mothers to balance their dual responsibilities effectively, ultimately enhancing their academic success and well-being.

Financial Challenges

From literature reviewed, financial constraints have emerged as a pervasive challenge across Sub-Saharan African contexts, with student mothers facing increased expenses while simultaneously experiencing reduced capacity for income generation. This is a pattern consistent with RST's (Goode, 1960) predictions about resource depletion across multiple role domains as well as the ethic of care theory.

Childcare Costs

The financial burden of childcare constitutes a primary challenge for student mothers across the region as in Ghana, Esia-Donkoh (2014) documented that, non-relative baby assistants cost between GHC20.00-40.00 (\$13-27) monthly, with total additional recurrent costs for babies under 6 months reaching GHC192.00 (\$148) monthly. Besides, Danky et al. (2019) in Ghana, found that, 65.9% of the respondents identified the cost of employing babysitters as a significant challenge. In contrast, although Kanana et al. (2021) in Kenya at Egerton University found 96% of the student mothers receiving financial support from their families, Ngunyi et al. (2025) reported that, the student mothers were facing financial difficulties, as 66.7% of them could not afford babysitters, subsequently finding it harder for them to balance both childcare and studies.

Additionally studies reviewed reported severe financial stress due to the cost of caring for children affecting their educational persistence as in South Africa, Maisela and Ross (2018, p. 51) quoted a student mother stating that, “...*sincerely speaking, finances are a very stressful factor in my life*”. Besides, Bukhosini (2019) found that, covering children's living expenses presented significant challenges for student mothers from disadvantaged backgrounds. Moreover, Kakuru (2021) documented that in Uganda, a student mother was making chapatis (flat bread) and supplying them into a nearby restaurant to earn income. In addition, beyond childcare and housing, student mothers face numerous child-related expenses. Further, in Ghana, Danky et al. (2019)

identified buying weaning food for babies and diapers as significant financial challenges

These financial challenges exemplify the interplay between RST and the Ethics of Care Theory. Since childcare necessitates substantial financial expenditure, fewer resources remain available for educational expenses, thereby creating financial role strain. Moreover, the time required for motherhood reduces the capacity for paid employment, further depleting financial resources. This creates a double squeeze of increased expenses and decreased income, illustrating the resource depletion mechanism central to role strain. The strain of managing multiple roles—as both a caregiver and a student, leads to overwhelming stress and compromises academic performance. Institutions are therefore advised to adopt a caring approach by implementing financial aid and support programs that alleviate these burdens, thus recognizing the interconnectedness of student mothers' responsibilities. By addressing these financial challenges with empathy and responsive policies, educational institutions can foster an environment conducive to both academic success and personal well-being.

Housing and transportation expenses

The literature reviewed from SSA reveals that institutional policies excluding student mothers from campus housing create additional financial burdens that exacerbate their challenges. In Uganda, Kigen et al. (2022) reported that married Muslim student mothers could not reside on campus because university facilities did not accommodate them. Similarly, at the University of Dar es Salaam, Kisanga and Matiba (2023) found that student mothers were denied accommodation that was available to other students. At Mwalimu Nyerere Memorial Academy, Kavishe (2025) quoted one student who stated, “After giving birth, I had to leave the hostel to arrange for a room”.

In Ghana, Amos et al. (2021) documented the absence of lactation rooms and adequate spaces for babysitters accompanying student mothers to lectures. Likewise, at the Islamic University in Uganda

(IUIU), all 30 study participants acknowledged policies supporting student marriage but criticized the complete lack of dedicated childcare facilities (Madinah et al., 2021, p. 80). One student articulated this institutional contradiction by saying, *“Surprisingly, an institution permits me to get married while studying but denies support after the fruits of that marriage. [...] Can a mother concentrate on studies when the safety of her child is not guaranteed?”* This statement starkly reveals the absurdity of institutional policies that recognize women's rights to marry and bear children but simultaneously withdraw crucial support necessary for their academic success.

These housing restrictions impose an additional financial strain on student mothers, compelling them to incur extra costs for private accommodation while managing parenting responsibilities. This scenario aligns with RST (Goode, 1960), which posits that competing demands on time and resources result in significant psychological tension. When student mothers are unable to secure adequate housing, they experience compounded stress due to increased financial obligations and challenges related to balancing childcare with academic responsibilities.

Transportation costs further complicate these challenges. Madinah et al. (2021) found that student mothers in Uganda faced high transportation costs, long walks, and difficulties navigating public transport with babies. In South Africa, Bukhosini (2019, p. 55) reported that student mothers spent many hours commuting each day, returning home exhausted and with insufficient time for academic work. Adofu (2013) similarly noted that transportation costs to and from school posed significant barriers for these students.

From the perspective of the Ethics of Care Theory, it becomes clear that failing to accommodate the unique needs of student mothers undermines their ability to succeed academically. Thus, institutions must recognize the interconnectedness of student mothers' responsibilities and the moral imperative to support them through empathetic and responsive policies. Providing suitable housing, including lactation rooms as advocated by

Alabi et al. (2025) in Nigeria, will minimize unnecessary movement and transportation costs. Additionally, addressing transportation challenges can help mitigate role strain, ensuring that student mothers have the necessary resources and time to balance caregiving and academic obligations. By fostering a more supportive environment, educational institutions can empower student mothers to thrive both academically and personally.

Social Challenges

The studies reviewed revealed that student mothers in SSA are experiencing stigma and social isolation as well as psychological stress as presented here under and analyzed through the lenses of role strain theory and ethic of care theory.

Stigma and Social Isolation

In Ghana, N-yelbi (2024, p. 52) documented how peers questioned student mothers' academic legitimacy by asserting that: *“Some of my peers questioned about my academic abilities and commitment to my studies since I was a nursing mother. It was disheartening... hence felt like I did not deserve to be on campus as a mother”*. This experience illustrates the Feminist Theory's concept of symbolic violence which is the internalization of patriarchal judgments that position motherhood and serious academic pursuit as mutually exclusive identities for women. Moreover, another Ghanaian student mother revealed the painful social consequences by contending that: *“Since my child is always seen as a disturbance to them, I prefer to be alone than to move with people who will not understand me. Though it is hurtful to be seen walking alone, for now, that is my only option”* (N-yelbi, 2024, p. 53).

Evidently, at Mwalimu Nyerere Memorial Academy in Tanzania, the moral dimensions of this stigma became explicit when a pregnant student reported that: *“some of my colleagues were not ready to work with us since they saw us as sinners”* (Kavishe, 2025:146). This framing of student pregnancy through religious-moral discourse exemplifies how

patriarchal ideologies utilize moral condemnation to control women's sexuality and reproductive choices. This also seems to suggest a particular stigma for unwed student mothers.

Moreover, in Nigeria, Kigen et al. (2022) found student mothers unable to associate freely with course mates and were often avoided by peers, thus demonstrating institutional complicity in social exclusion. Similarly, in Uganda, stigmatized mothers were found to face sociocultural challenges and were often neglected by fathers while relying on parental support and striving for additional income (Kakuru, 2021). Likewise, in Namibia, Taukeni (2014) documented the psychological manifestations of this isolation, with student mothers reporting anger, restlessness, loneliness, and drowsiness which are symptoms reflecting the embodied consequences of social marginalization.

These findings highlight the profound impact of social challenges, including patriarchy, stigma, and inadequate support networks, on student mothers across SSA. The experiences of stigmatization and social isolation reveal how these women encounter not only the burden of academic responsibilities but also the weight of societal judgment, which exacerbates their role strain. RST (Goode, 1960) emphasizes the psychological tension resulting from competing demands, and in this context, it is evident that the societal expectations imposed on student mothers significantly detract them from their academic performance and emotional well-being. Furthermore, the Ethics of Care underscores the moral imperative for institutions to cultivate a supportive environment that acknowledges the interconnectedness of caregiving and educational responsibilities. By implementing policies and support systems that address stigma and foster inclusivity, educational institutions can help alleviate the role strain experienced by student mothers. This approach not only promotes their academic success but also empowers them to navigate the complexities of motherhood and education without the burden of social isolation and prejudice

Loss of Social Engagement and Inadequate Support Networks

The literature consistently documents how maternal responsibilities prevent student mothers from engaging in social activities that are crucial for peer connection and academic networking. In Ghana, Esia-Donkoh (2014, p. 31) found that student mothers missed many social interactions, with their only peer engagement occurring in church, leading to significant social isolation as they remained indoors caring for their babies. Similarly, N-yelbi (2024) reported that pregnant and parenting students often avoid social contact as a strategy to manage academic demands, which subsequently exacerbates their psychological challenges. This isolation results in a loss of vital faculty, departmental, and university social activities, further compounding the difficulties of balancing academic work with childcare responsibilities.

In South Africa, the research presents a complex picture regarding support systems. Bukhosini (2019) highlighted that childcare remains predominantly a maternal responsibility in KwaZulu-Natal, reflecting entrenched patriarchal norms and underscoring the absence of adequate support for student mothers managing dual roles. Conversely, Maisela and Ross (2018) found that family and friend support enabled some South African student mothers to navigate their social, emotional, and financial challenges. This illustrates the critical role of social support networks in alleviating the effects of role strain.

At the University of KwaZulu-Natal, Shange and Maharaj (2025) noted that student mothers often rely heavily on their parents for care, suggesting that intergenerational support can compensate for the absence of partner support. Similarly, in Kenya, Kanana et al. (2021) reported that student mothers at Egerton University identified their primary need as having *"someone to talk to and assure them that it is possible,"* emphasizing the importance of emotional validation alongside practical support.

From the perspective of the Ethics of Care Theory, it is evident that institutions must prioritize creating supportive environments that acknowledge the unique challenges faced by student mothers. An

empathic community that recognizes the importance of social engagement and adequate support networks, educational institutions can help mitigate the effects of role strain. Ensuring that student mothers feel connected and supported not only empowers them to succeed academically but also fosters their emotional well-being, ultimately leading to a more inclusive and thriving academic environment.

Psychological Stress

In South Africa, Bukhosini (2019:56) documented the psychological impact of the role conflict of which sometimes, a student mother is at school and a child at home is sick. When she gets a call telling her that “a child is sick at home, she cannot focus on her studies,” Besides, in Ghana, Amos et al. (2021:4) reported similar experiences that *“Sometimes, I skip lectures so as to take my baby to the hospital when he is sick. Basically, it affects my studies since I cannot concentrate on my studies.”*

In Uganda, Opit et al. (2020) revealed the impossible dilemmas breastfeeding student mothers face at Kyambogo University which is choosing between baby-sitting versus attending lectures; completing a lecture versus breastfeeding a crying hungry baby; undertaking child bonding activities versus academic activities; completing an exam or test versus breastfeeding a crying hungry baby; baby care versus attending academic group discussions and baby care versus completing coursework assignments on time. These dilemmas illustrate RST’s concept of the role conflict in its most acute form, situations where both roles demand immediate attention of which any choice results in failure in one domain.

In Namibia, Taukeni (2014:96) quoted a frustrated student mother who asserted that *“Sometimes I can be restless, not in a mood, not having time to study. Sometimes I have an appointment to see the doctor consequently ending up skipping lectures”*. Consequently, Adofo (2013) recommended guidance and counseling services in Ghana in order to address these psychological burdens.

These psychological stressors reflect how the intersecting challenges of academic, financial, and social strains create mental health impacts that further compromise educational success. From the perspective of RST (Goode, 1960), the mental health challenges arise from the sustained overload of trying to meet all role demands simultaneously without adequate resources or institutional support. Moreover, the Ethics of Care underscores the necessity for educational institutions to recognize these unique burdens and adopt a compassionate approach that fosters an environment of support, understanding, and resources tailored for student mothers. By prioritizing the well-being of these women through empathetic policies, institutions can help mitigate psychological stress and promote a healthier balance between caregiving and academic success.

4. Conclusion

This comprehensive literature review has critically examined the multifaceted challenges facing student mothers pursuing higher education across Sub-Saharan Africa, grounded in RST (Goode, 1960) and the Ethics of Care Theory. The synthesis of evidence from Kenya, Ghana, South Africa, Uganda, Ghana, Nigeria, and Tanzania reveals consistent patterns of academic, financial, and social challenges that fundamentally compromise the educational experience of student mothers throughout the region.

Academically, student mothers face severe role overload, which manifests as concentration deficits, sleep deprivation, frequent class absences, and missed assignments, thereby validating RST's assertion that insufficient time and energy hinder the fulfillment of dual role demands. Financially, they contend with substantial childcare costs, housing expenses due to exclusion from campus accommodation, transportation hurdles, and other child-related expenses, all while struggling with reduced capacity for income generation. Socially, they encounter stigmatization, isolation, and judgment from peers, compounded by inadequate support networks and institutional failures to

provide essential resources, such as childcare facilities and flexible policies. This disconnect illustrates how HEIs are predominantly designed for traditional students without caregiving responsibilities, thereby systematically disadvantaging student mothers.

This review contributes significantly to literature as one of the few comprehensive regional syntheses that demonstrate the intersection of academic, financial, and social challenges. By integrating RST and the Ethics of Care, it highlights the need for compassionate institutional support tailored to student mothers' unique circumstances.

The findings advocate urgent policy interventions, including the establishment of on-campus childcare centers, provision of family-friendly housing, creation of lactation rooms, and implementation of flexible attendance policies. Furthermore, targeted financial assistance and comprehensive support programs addressing all challenge dimensions are essential. While this review acknowledges limitations, including geographic gaps and a predominant deficit focus, it paves way for future research aimed at enhancing inclusive learning environments. Ultimately, empowering student mothers to manage their academic and parenting roles is crucial for their success in completing higher education while fulfilling their caregiving responsibilities.

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6. Short biography

Professor Joyce Nemes is an Associate Professor in the Department of Educational Management and Policy Studies at the College of Education, University of Dodoma (UDOM), Tanzania. She holds several qualifications, including a Certificate and Diploma in Education from Tabora Teachers College, a B.Ed. in Arts, and an M.Ed. from the University of Dar es Salaam (UDSM). Additionally, she earned a Ph.D. from UDOM, a Postgraduate Diploma in Leadership from the Uongozi Institute and Aalto University, Finland, and a Postgraduate Diploma in Law from OUT. Professor Nemes has also completed certificates in Corporate Governance and the Female Feature Tanzania Programme. She is a Certified Director (IoDT) and holds a Master of Arts in Peace and Security Studies, along with a Postgraduate Diploma in Curriculum Design and Development from OUT. She has several publications in her area of specialization, contributing to education at the primary, secondary, and higher education levels. Recently, she was appointed Director of Quality Assurance at UDOM, Tanzania.

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Teacher-Student Relationships and Engagement Strategies on Teenage Mothers' Learning in Non-Formal Secondary Education

The Case of Tanzania

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Keywords

Teenage mother, Tanzania, education, teacher-student relationship.

Abstract

This study examined the influence of teacher–student relationships and engagement strategies on the learning of teenage mothers in non-formal secondary education (NFSE) settings in Tanzania. A mixed-methods approach was adopted, combining questionnaire data from 197 teenage mothers and 91 teachers with semi-structured interviews from six selected NFSE centres. The data were analysed descriptively and thematically. The findings revealed that positive teacher–student relationships, characterised by respect, open dialogue, and emotional support, significantly enhance teenage mothers' engagement and participation. However, despite teachers' awareness of learners' low motivation and unique challenges, there is limited implementation of individualised support, mentoring, and structured engagement strategies. The study contributes to existing knowledge by demonstrating the critical role of relational and pedagogical practices in improving educational participation among teenage mothers in NFSE contexts. It recommends targeted professional development for teachers, strengthened institutional support systems, and improved policy frameworks that promote inclusive education and quality education or sustainable conditions for young mothers.

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1. Introduction

The global challenge of teenage pregnancy continues to disrupt girls' educational trajectories, particularly in developing nations where early motherhood significantly limits future socio-economic opportunities (UNESCO, 2015; UNFPA, 2020; World Bank, 2022). In Tanzania, the repercussions of teenage pregnancies have prompted vital policy reforms aimed at facilitating the re-entry of young mothers into formal schooling or alternative pathways such as Non-Formal Secondary Education (NFSE) centers (MoEST, 2024). The introduction of Education Circular No. 2 of 2021 allows young mothers to continue their education after childbirth, embodying Tanzania's commitment to the principles of the Sustainable Development Goals (SDG 4), which advocate for inclusive and equitable quality education for all (UNESCO, 2015). This policy aligns with a broader recognition of the need for educational systems to be responsive to the unique challenges faced by teenage mothers, reflecting a shift towards creating educational environments that support their specific needs and aspirations.

Despite these advancements in access, the sustained engagement of teenage mothers in NFSE remains a significant challenge, as they often confront a multitude of academic, social, and psychological obstacles. Rigid educational timetables frequently clash with childcare responsibilities, forcing many to choose between attending classes and fulfilling their roles as primary caregivers. In addition, financial constraints can limit access to necessary resources, further exacerbating dropout rates (Mgunda et al., 2024). Social stigma attached to teenage motherhood compounds these issues, leading to feelings of low self-esteem and emotional stress that can hinder academic participation (Fallis, 2013; Birungi et al., 2015; Mgunda et al., 2024; Tobister et al., 2024). The role of teachers is critical in this context, as insufficient teacher preparedness and a lack of psychosocial support uniquely affect the educational outcomes of teenage mothers (Costantine et al., 2025). A supportive and understanding classroom environment can significantly mitigate some of the barriers these young women face, highlighting the need for professional development that equips teachers with the skills to address these challenges effectively.

International and national initiatives reflect a growing recognition of the need to support teenage mothers in educational settings (MoE, 2020; UNICEF, 2022). However, despite the commitment underscored by policies, the persistent issues faced by young mothers suggest that the gap between policy aspirations and classroom realities remains wide. In developed countries, the support offered to teenage mothers often includes flexible scheduling, access to childcare, and life skills training aimed at fostering empowerment and resilience (Lee et al., 2020; World Bank, 2019). However, in many Sub-Saharan African contexts, while some re-entry policies have been established, systematic challenges such as inadequate financial resources, stigma, and insufficient educational infrastructure continue to limit their effectiveness (Ngaza& Mwila, 2022; Timothy & Juhudi, 2023). These compounded challenges suggest that access alone is not enough; there must be a comprehensive approach that considers the full range of obstacles teenage mothers encounter.

The current body of literature has extensively documented the policy landscape surrounding teenage mothers and the systemic barriers they face in re-entering education (Darroch et al., 2016; Tobister et al., 2024; Mgunda et al., 2024). Yet there is a notable empirical gap concerning the specific interactions and dynamics within NFSE classrooms that influence learning outcomes for teenage mothers. Specifically, the role of teachers, particularly their instructional strategies, levels of psychosocial support, and overall attitudes toward this demographic, has received insufficient attention (Tobister et al., 2024). Understanding how these factors play into the broader educational experience is critical for developing effective teaching methods tailored to meet the unique needs of teenage mothers. The dynamics in NFSE classrooms are pivotal for translating policies into practical support, and enlightening this aspect could lead to improved engagement and academic success for young mothers.

This study aims to fill the existing knowledge gap by investigating the specific ways teachers influence the educational experiences of teenage mothers. It seeks to assess teachers’ engagement strategies, delve into the psychosocial support they provide, and explore their attitudes toward teaching teenage mothers within the NFSE framework (Darroch et al., 2016).

By concentrating on these teacher-related determinants of engagement, the research aspires to generate empirical evidence that can inform interventions aimed at enhancing teacher capacity and fostering supportive learning environments. This study ultimately aims to contribute significantly to the discourse on effective educational practices for teenage mothers, focusing on actionable recommendations that can improve academic outcomes and engagement in Tanzanian NFSE centers.

Objective of the study and Research Question

This study examines how teachers' engagement strategies and attitudes influence the learning experiences and academic engagement of teenage mothers in non-formal secondary education (NFSE), addressing the research question: How do teachers' engagement strategies and attitudes affect the learning experiences and academic engagement of teenage mothers in NFSE settings?

Theoretical Underpinning of the Study

The foundation of this study is rooted in educational engagement theory as articulated by Rachmad (2022), which posits that engagement is a dynamic and collective endeavor requiring active involvement and commitment from all participants in the learning process, including students, teachers, and educational institutions. This theory transcends the simplistic notion of physical presence in the classroom, framing engagement as a complex construct that intricately weaves together emotional, cognitive, and behavioral dimensions of student involvement in educational activities (Rachmad, 2022). For teenage mothers in Non-Formal Secondary Education (NFSE) settings, this theoretical lens is particularly vital, as it highlights the importance of customizing educational methodologies to resonate with their distinct needs and interests. Key indicators of engagement delineated by this theory, such as enhanced attendance, active class participation, improved academic performance, and greater satisfaction with learning experiences, are critical metrics for evaluating the effectiveness of educational strategies tailored to this demographic (Wang, 2025). The practical applications of educational engagement theory within the context of the current study are

profound. It underscores the obligation of educators to cultivate an environment that actively promotes engagement, specifically addressing the unique hurdles faced by teenage mothers. By employing interactive and supportive teaching strategies, including engaging instructional methods and robust psychosocial support systems, educators can empower teenage mothers to attain both academic and personal success. Furthermore, this theoretical framework provides a comprehensive understanding of how various factors, such as the attitudes of teachers and the mechanisms of support can significantly elevate engagement levels among teenage mothers in educational contexts. Ultimately, this focus on engagement equips individual teenage mothers with the essential skills needed to navigate their challenges and positively reshape their educational trajectories and everyday lives. Such an emphasis is crucial for fostering long-term educational advantages, enabling these young women to break free from the cycles of poverty and inequality often exacerbated by early motherhood, thereby enhancing their overall quality of life and future prospects.

2. Methodology

Research approach and design

The study employs a mixed methods research approach utilizing a convergent parallel design, which is particularly beneficial for exploring the multifaceted issue of teachers' influence on teenage mothers' engagement in learning within Non-Formal Secondary Education (NFSE) centers. By integrating both quantitative and qualitative data, this approach enhances the validity and credibility of the findings, enabling a more nuanced interpretation of the results (Creswell, 2018). Specifically, quantitative data provided measurable insights into engagement levels and academic performance, while qualitative data can offer rich, contextual understanding of the experiences and challenges faced by teenage mothers in the classroom. This duality not only allows for a more comprehensive analysis of the research problem but also adds value by addressing the limitations often associated with singular methodological approaches. The practical implication in this context is that the findings can inform more effective educational strategies and policy

development, aimed at improving the learning environment for teenage mothers. Ultimately, the utilization of mixed methods provides a broader perspective on how teachers' instructional approaches and support systems can be optimized to enhance engagement and educational outcomes for this vulnerable group.

Sampling Procedure and Sample Size

This study was conducted in six Non-Formal Secondary Education (NFSE) centers selected from a total of fourteen in Mwanza Region, utilizing a simple random sampling technique to ensure that each center had an equal chance of inclusion. The sample consisted of 197 teenage mothers and 91 teachers drawn from these centers, which enhances the representativeness and generalizability of the findings. Additionally, purposive sampling was employed to select key informants, including six center coordinators (one from each selected center), a Regional Resident Tutor, and a Regional Adult Education Officer. This dual approach provides a robust data set, combining quantitative insights with qualitative, in-depth perspectives essential for understanding the contextual factors influencing engagement among teenage mothers. The informants provided their expertise and experiences enrich the study, allowing for a more comprehensive and nuanced exploration of the educational dynamics at play. This holistic understanding is crucial for developing effective strategies and policies tailored to improve engagement and support for teenage mothers in NFSE environments.

Data Collection, Analysis Plan and Ethical Concern

Data for this study were collected using questionnaires administered to 197 teenage mothers and 91 teachers, incorporating both open and closed-ended questions to gather comprehensive information on teachers' approaches that enhance teenage mothers' engagement in learning within Non-Formal Secondary Education (NFSE) centers. Additionally, semi-structured interviews were conducted with key informants to gain detailed insights into the strategies teachers employ to influence engagement among teenage mothers. This mixed-methods approach allowed for the triangulation of data, enriching the overall understanding of the educational dynamics at play.

However, analysis was made descriptively through mean and standard deviation for the quantitative data, whereas thematic analysis was for the qualitative data. The study adhered to established ethical standards, obtaining necessary ethical clearance and permissions from relevant authorities, including the University of Dodoma Research Committee and the Mwanza Regional Administrative Secretary. Participants were thoroughly informed about the study's purpose, and informed consent was secured prior to data collection. To maintain confidentiality and anonymity, pseudonyms were used, and data were stored securely with appropriate encryption measures.

Validity and Reliability of the Study

To ensure the reliability of the data collection tools, Cronbach's Alpha was applied to the quantitative data, serving as a method to assess the internal consistency of the scales employed in the study. A reliability coefficient above the commonly accepted threshold of 0.70, as indicated by Creswell (2018) and Taber (2018), was considered a marker of good reliability, suggesting that the items within the scales are measuring the same underlying construct. In addition to this quantitative measure, the study also addressed key aspects of trustworthiness, specifically focusing on credibility, dependability, transferability, and confirmability. These components are crucial for enhancing the overall integrity of the research findings. By implementing these measures, the study ensured that the data collected not only accurately represent the educational experiences of teenage mothers in non-formal educational (NFSE) settings but also provide valuable insights for developing effective educational strategies and interventions tailored to their unique needs. Thus, the combined use of Cronbach's Alpha and trustworthiness criteria contributes to a robust understanding of the subject matter.

3. Results

Approaches Teachers use to engage teenage mothers in the teaching and learning

This study sought to explore the approaches teachers use to engage teenage mothers in the teaching and learning process in the NFSE program. Based on the analysis, the following sub-themes were identified to address the third specific objective of the study, which is the teacher-student relationship, teaching strategies and methods, formative assessment techniques, motivation and engagement techniques, support systems and resources and professional development and training.

Teacher-Student Relationships

This study aimed to explore whether or not the teacher-student relationship encouraged learners to participate fully NFSE programme. A Likert scale with five points (i.e., 1. Strongly Agree =SA, 2. Agree = A, 3. Neutral = N, 4. Disagree = D, 5. Strongly Disagree = SD) was used to ascertain the teacher-student relationship and how it affects teenage mothers' school engagement, are presented in Table 4.1:

Table 4.1 Teacher-Student Relationships

Statement	Likert Scale				
	SD	D	N	A	SA
I encourage teenage mothers to share their personal experiences in classroom discussions.	3(3.3%)	20(21.98%)	16(17.58%)	25(27.47%)	27(29.67%)
I create a welcoming environment for teenage mothers at the beginning of each class.	5(5.49%)	19(20.88%)	25(27.47%)	10(10.99%)	32(35.16%)

I try to learn the names of all teenage mothers in my class within the first week of the term.	3(3.3%)	16(17.58%)	19(20.88%)	24(26.37%)	29(31.87%)
I follow up with teenage mothers after expressing their concerns about their studies.	3(3.3%)	16(17.58%)	19(20.88%)	30(32.97%)	23(25.27%)
I provide one-to-one learning support to teenage mothers after a normal class session	6(6.59%)	35(38.46%)	15(16.48%)	14(15.38%)	21(23.08%)
I encourage teenage mothers to participate in every classroom activity	3(3.3%)	23(25.27%)	15(16.48%)	30(32.97%)	20(21.98%)
I respect the opinions of teenage mothers during classroom discussions	2(2.2%)	7(7.69%)	26(28.57%)	26(28.57%)	30(32.97%)
I maintain a positive attitude to foster trust with teenage mothers in my class.	17(18.68%)	20(21.98%)	6(6.59%)	21(23.08%)	27(29.67%)
I invite teenage mothers to visit my office whenever they experience learning challenges	1(1.1%)	26(28.57%)	7(7.69%)	27(29.67%)	30(32.97%)

Data from Table 4.1 indicates that a significant number of teachers, 57 (62.6%), agreed that they invite teenage mothers to visit their offices whenever they face learning challenges. Additionally, 56 (61.5%) affirmed that they respect the opinions of teenage mothers during classroom

discussions. Moreover, 53 (58.2%) of teachers reported that they not only follow up with teenage mothers after they express concerns about their studies, but also try to learn the names of all teenage mothers in their classes within the first week of the term. By inviting teenage mothers to visit their offices, respecting their opinions, and actively following up with those who face challenges, the teachers demonstrate respect, kindness, understanding, commitment, and trustworthiness. This approach helps establish and maintain a caring and warm environment for the teenage mothers.

However, the study revealed that 41(45%) disagreed that they provided one-to-one learning support to teenage mothers after a normal class session, whereas only 35(38.9%) agreed with the notion. This indicates that there are a few teachers who provide one-to-one mothers one to one learning support. These findings are important because they show the strengths and gaps in teacher–student relationships with teenage mothers, highlighting generally positive interaction and respect, but also revealing inconsistencies in individualized support, follow-up, and accessibility, with implications for strengthening trust, communication, and consistent learner support.

Through an interview, teenage mothers were asked to indicate the quality of the teacher-student relationship they aspired to. Teenage mothers pointed towards the different personal characteristics – what we refer to as ‘teacher being’ – that they found important in order for a teacher to be considered a good teacher. These characteristics reflect the teacher’s capacity to relate to the teenage mothers and to do a good job as a teacher. One teenage mother said,

“A teacher should be ‘caring’, ‘fair’, ‘kind’ and ‘funny’”, and ‘fair’. Another teenage mother said: “To me, a good teacher is the one who thinks about students, makes the students happy. Think about what is best for the students... make students feel safe with him/her” ...

teenage mother said thatthey wanted their teachers to build relationships with them by getting to know them, listening to them, and being friendly. Or, as some students suggested, by being like an ‘extra parent’ (e.g. ‘They should

be like an extra parent, like my parent during the daytime). According to the teenage mothers, if teachers were considered not to represent these personal characteristics, such as being hostile and aggressive instead of kind, being too strict, uncaring, unhelpful, and unfair, and not building relationships with the students, this would have a negative influence on students' learning process.

In sum, the analysis of the students' narratives highlights how teachers are viewed as promoters of a good school climate, where 'teacher doing' and 'teacher being' connect to students' learning environment, engagement, and sense of safety at school. From the teenage mothers' perspectives, the two categories reveal how teachers can influence the classroom climate and student engagement through their actions by influencing students to be more or less on task, to enjoy their lessons and to be more or less disruptive, and through their beings by building trustful relationships, making students feel safe and being helpful. The teenage mothers reveal the importance of teachers being strict and building relationships with students, in the classroom and elsewhere, and both of these aspects are important for students' engagement, learning, and sense of safety. For example, teenage mothers stated that they became less engaged in their learning tasks if teachers did not use classroom management to handle disruptive behaviour, but how this was done was also important, as teenage mothers wanted strict but kind teachers in order to feel safe at school.

Teaching Strategies and Methods

This study also sought to identify teaching strategies and methods used by teachers to influence teenage mothers' engagement in classroom activities. A Likert scale with five points (i.e., 1. Strongly disagree =SA, 2. Disagree = A, 3. Neutral = N, 4. Agree = D, 5. Strongly agree = SD) was used to ascertain the teaching strategies and methods influence teenage mothers' engagement. The results generated on this are presented in Table 4.2:

Table 4.2. Teachers' Responses Related to Teaching Strategies and Methods

Statement	Likert Scale				
	SD	D	N	A	SA

I plan learning activities according to learners' abilities	24(26.37%)	10(10.99%)	1(1.1%)	30(32.97%)	26(28.57%)
I incorporate hands-on activities in every teaching lesson.	8(8.79%)	27(29.67%)	25(27.47%)	1(1.1%)	30(32.97%)
I use group discussion and collaborative learning activities	0(0%)	8(8.79%)	7(7.69%)	34(37.36%)	42(46.15%)
I integrate technology into my lessons to enhance learning in my lesson	0(0%)	7(8.79%)	3(3.3%)	8(8.79%)	4(4.4%)
I often focus on my students' interests during teaching	3(3.3%)	12(13.19%)	11(12.09%)	64(70.33%)	1(1.1%)
I often provide constructive feedback to my students	20(21.98%)	15(16.48%)	11(12.09%)	28(30.77%)	17(18.68%)
I assess my students' learning by using different assessment techniques.	70(76.92%)	3(3.3%)	5(5.49%)	9(9.89%)	4(4.4%)
I often develop a conducive learning atmosphere in the classroom during class sessions by telling my students the aim and purpose of this program	13(14.29%)	15(16.48%)	16(17.58%)	27(29.67%)	20(21.98%)

The data in Table 4.2 indicates that a large number of teachers, 76 (83.5%), agree that they use group discussion and collaborative learning activities to facilitate students' interactions. It was followed by 65 (71.4%) who agree that they frequently focus on their students' interests while teaching, whereas 56 (61.5%) agree that they plan learning activities according to learners' abilities. Further analysis shows that 47 (51.6%) often create a conducive learning atmosphere in the classroom during lessons by explaining the aim and purpose of the programme, whereas 45(49.5%) agreed that they frequently provided constructive feedback to my students. This finding shows teachers use various teaching strategies, including the use of focus groups and collaborative learning strategies, focus on learners' interests during teaching and create a conducive teaching and learning environment. These findings are important because they reveal strengths and gaps in teachers' teaching strategies for supporting learners, showing the need to improve inclusive methods, technology integration, assessment techniques, and classroom practices to enhance effective learning engagement.

Motivation and Engagement Techniques

Using a Likert scale with five points, teachers were asked to rate the motivation and engagement techniques they often used in their classroom. Their responses have been processed into the details presented in Table 4.3:

Table 4.3 Teachers' Responses Related to Motivation and Engagement Techniques

Statement	Likert Scale				
	SD	D	N	A	SA
It is my responsibility to engage and motivate teenage student mothers'	27(29.67%)	33(36.26%)	7(7.69%)	2(2.2%)	22(24.18%)

I do believe that I have adequate resources and strategies to use when teen student mothers are not engaged	26(28.57%)	32(35.16%)	7(7.69%)	2(2.2%)	24(26.35)
Sometimes I change my timetable to accommodate teenage student mothers who miss regular class time	26(28.57%)	34(37.36%)	22(24.18%)	7(7.69%)	2(2.2%)
I do care about teenage student mothers learning in my class	36(39.56%)	26(28.57%)	4(4.4%)	1(1.1%)	24(26.37%)
I do believe that the learning motivation for mothers of teenage students in my subject is low	77(84.62%)	7(7.69%)	0(0%)	0(0%)	7(7.69%)
I do believe that teenage student mothers need more support than others do in my class	14(15.4%)	2(2.2%)	0(0%)	39(42.9%)	36(39.6%)
I do believe that my classroom activities support learning for teenage student mothers	32(35.16%)	27(29.67%)	0(0%)	7(7.69%)	25(27.47%)

Data in Table 4.3 shows that the majority of teachers, 78(85.7%), agreed with the notion that they believed the learning motivation for mothers of teenage students in my subject is low. It was followed by 75(82.4%) who agreed that they believed that teenage student mothers need more support than others do in their class. Ironically, further analysis revealed that only 24(26.4%) teachers agreed that it was their responsibility to engage and motivate teenage student mothers, while over two-thirds, 60(65.9%), disagreed. In the same vein, only 9(9.9%) agreed with the notion that sometimes they changed their

timetables to accommodate teenage student mothers who miss regular class time and again over two-thirds, 60(65.9%), disagreed. More importantly, over two-thirds 59, 64.8%) did not believe that their classroom activities support the needs of teenage student mothers. This comes to suggest that despite teachers agreeing that teenage mothers had low motivation to learn and they need an individualised support programme, they were not ready to provide any of them. These findings are important because they reveal strengths and gaps in teachers’ motivation and support for teenage student mothers, showing the need to improve engagement strategies and classroom support.

Support Systems and Resources

This study also sought to assess the support system and resources available to influence students' engagement in the NFSE programme. To achieve this objective, teachers were asked to indicate their level of support systems and resources available to support teenage mothers' engagement in the NFSE programme by using a five-point Likert scale and findings are summarised in Table 4.4.

Table 4.4 Teachers' Responses Related to Support Systems and Resources

Statement	Likert Scale				
	SD	D	N	A	SA
I inform teenage mothers about available support services (e.g., counselling, childcare)	3(3.3%)	30(32.97%)	31(34.07%)	25(27.47%)	2(2.2%)
I collaborate with social workers to address the needs of teenage mothers.	25(27.47%)	26(28.57%)	22(24.18%)	16(17.58%)	2(2.2%)
I encourage participation in extracurricular activities that support teenage mothers.	27(29.67%)	28(30.77%)	19(20.88%)	14(15.38%)	3(3.35)

I connect students with mentors or role models at least once every term.	44(48.35%)	18(19.78%)	10(10.99%)	13(14.29%)	6(6.59%)
I facilitate communication between students and their families regarding educational needs at least once a month.	27(29.67%)	33(36.26%)	22(24.18%)	7(7.69%)	2(2.2%)
I offer free textbooks to every teenage mother	24(26.35)	7(7.69%)	2(2.2%)	26(28.57%)	32(35.16%)

Based on the results from Table 4.4, support systems and resources for teenage mothers in the NFSE programme are underutilized and inconsistent. A significant majority of teachers (67.04%) either disagree or strongly disagree with informing teenage mothers about available support services, such as counselling and childcare. This indicates a major gap in connecting students with essential resources. Similarly, collaboration among staff is weak: over half of teachers (56.04%) report that they do not work with colleagues to address the needs of this group of students. While slightly less pronounced, a majority (60.44%) also do not allocate time for these students to participate in supportive extracurricular activities. Most strikingly of all, efforts to engage families are severely lacking: a combined 68.13% of teachers either disagree or strongly disagree with the statement that they communicate with families about educational needs every month. These findings are important because they reveal gaps and strengths in teachers' support for teenage mothers, showing implications for improving counselling, mentorship, family communication, and coordinated educational support.

4. Discussions

The findings of this study underscore the significant influence that teacher-student relationships have on the engagement of teenage mothers in non-formal educational (NFSE) programs. Data reveal that a large number of teachers are committed to cultivating welcoming atmospheres by encouraging students to share personal experiences and respecting their viewpoints. This approach aligns with the work of Reyes et al. (2012), who argue that supportive relationships between teachers and students are instrumental in creating a positive classroom environment that enhances learning engagement. These findings are in line with educational engagement theory as articulated by Rachmad (2022), which posits that engagement is a dynamic and collective endeavor requiring active involvement and commitment from all participants in the learning process, including students, teachers, and educational institutions. This theory transcends the simplistic notion of physical presence in the classroom, framing engagement as a complex construct that intricately weaves together emotional, cognitive, and behavioral dimensions of student involvement in educational activities (Rachmad, 2022). For teenage mothers in Non-Formal Secondary Education (NFSE) settings, this theoretical lens is particularly vital, as it highlights the importance of customizing educational methodologies to resonate with their distinct needs and interests. However, the need for individualised attention remains a concern, as nearly half of the teachers reported insufficient one-on-one interactions with their students. This lack of personal connection may hinder the establishment of deeper relationships essential for educational success, as emphasized by O'Connor and McCartney (2007). The preferences expressed by teenagers for caring, approachable, and understanding teachers reflect their need for emotional support, reinforcing Pianta and Hamre's (2009) assertion that positive interactions with teachers are crucial in influencing engagement and academic performance. Key indicators of engagement delineated by this theory, such as enhanced attendance, active class participation, improved academic performance, and greater satisfaction with learning experiences, are critical metrics for evaluating the effectiveness of educational strategies tailored to this demographic (Wang, 2025).

The study further highlights the impact of diverse teaching strategies and methods on the engagement of teenage mothers. Teachers who prioritize group discussions and collaborative activities, as indicated by 83.5% of respondents, align with literature suggesting these techniques effectively promote student engagement (Wang & Eccles, 2013). Nonetheless, while there is recognition among teachers of the necessity to tailor lesson plans to students' abilities, many still limit their use of hands-on activities and technology integration. This limitation correlates with Rachmad's (2022) Educational Engagement Theory, which suggests that a failure to employ varied teaching methods may alienate students. Engaging students through topics that resonate with their personal experiences is vital, as outlined by Kindermann (2007). Without these tailored strategies, teenage mothers may find it challenging to maintain interest and motivation, complicating their educational pursuits. The practical applications of educational engagement theory within the context of the current study are profound. It underscores the obligation of educators to cultivate an environment that actively promotes engagement, specifically addressing the unique hurdles faced by teenage mothers. By employing interactive and supportive teaching strategies, including engaging instructional methods and robust psychosocial support systems, educators can empower teenage mothers to attain both academic and personal success.

A critical aspect of fostering a conducive learning environment involves understanding motivation and engagement. While most teachers recognize that teenage mothers need additional support, only a minority acknowledge the importance of actively motivating these students. This gap signifies a misalignment between teachers' perceptions of students' needs and the necessary actions required to enhance engagement. Scholars like Nelson and Debacker (2008) emphasize the importance of motivation for academic success, particularly for at-risk groups such as teenage mothers. Although teachers may perceive a lack of motivation among these students, their hesitation to adopt strategies that engage these learners reveals a pressing issue in both teacher training and professional development. This disconnect illustrates the urgent need for educators to embrace more proactive methods to inspire motivation, advocating for a mentoring approach rather than merely

instructional. Educational engagement theory provided a comprehensive understanding of how various factors, such as the attitudes of teachers and the mechanisms of support can significantly elevate engagement levels among teenage mothers in educational contexts. Ultimately, this focus on engagement equips individual teenage mothers with the essential skills needed to navigate their challenges and positively reshape their educational trajectories and everyday lives. Such an emphasis is crucial for fostering long-term educational advantages, enabling these young women to break free from the cycles of poverty and inequality often exacerbated by early motherhood, thereby enhancing their overall quality of life and future prospects.

Finally, the study uncovers significant gaps in the availability and use of support systems for teenage mothers within the NFSE program. Teachers report minimal interaction with support services, mentorship programs, and extracurricular activities designed to assist these students. Despite recognizing the needs of teenage mothers, educators frequently fail to connect them with existing support, as highlighted by Ngaza and Mwila (2022). This aligns with Shaningwa’s (2007) finding that supportive educational environments are critical in helping teenage mothers overcome various barriers. To address these deficiencies, fostering effective communication and collaboration between educators and support staff is essential, as emphasized by Mushi (2012). Such comprehensive support systems should collectively address the diverse needs of students holistically. Integrating these insights with Educational Engagement Theory reinforces the necessity of engagement in transforming educational experiences for teenage mothers, highlighting that active participation fosters not just academic achievement but also emotional welfare.

5. Conclusion

The study illuminates the profound impact that teachers have on the engagement of teenage mothers in non-formal secondary education (NFSE) centers. It becomes clear that strong teacher-student relationships are foundational to fostering an environment conducive to learning. The findings demonstrate that when teachers create welcoming atmospheres that

encourage open dialogue and respect for students' opinions, they significantly enhance student engagement. However, the study also highlights gaps in personalized support, as many teachers reported limited one-on-one interactions, which are critical for building deeper connections. This lack of individualized attention may hinder the educational experience for teenage mothers, as emotional support is essential for their motivation and academic success. Teachers' roles extend beyond imparting knowledge; they are key figures who must nurture trust and understanding, thereby influencing both engagement and positive academic outcomes.

Furthermore, the effectiveness of teaching strategies plays a vital role in engaging teenage mothers. The study shows that while collaborative learning techniques are widely embraced, there remains reluctance among some educators to diversify their instructional methods through hands-on activities and technology integration. This limitation could alienate students and diminish their interest in learning. The observations call for a reassessment of how teachers approach engagement, particularly by recognizing the unique challenges faced by teenage mothers in NFSE settings. By aligning their practices with proven strategies that resonate with students' interests and experiences, educators can significantly improve learning outcomes. Therefore, the study emphasizes the urgent need for professional development that equips teachers with the skills and strategies necessary to effectively mentor and motivate teenage mothers, ultimately fulfilling the educational aims of empowerment and personal growth in non-formal educational contexts. The study further concludes that while teachers show positive attitudes toward supporting teenage mothers, there are still major gaps in individualized support, motivation strategies, teaching methods, and use of support systems; therefore, the study's main contribution should be clearly focused on these four areas, and recommendations should be more practical by emphasizing teacher training, mentorship, stronger support linkages, and consistent follow-up systems.

6. Recommendations

The study recommend that structured teacher training programs be developed and implemented to equip NFSE educators with practical skills in learner-centred pedagogy, emotional support, motivational strategies, and the use of diverse instructional methods such as collaborative learning, hands-on activities, and technology integration to effectively engage teenage mothers. These interventions should be jointly implemented by educational authorities, NFSE program coordinators, school administrators, and social welfare stakeholders to ensure coordinated and sustainable support. At policy level, there is a need to strengthen guidelines that mandate inclusive teaching practices, compulsory in-service training on adolescent motherhood, and formal referral systems linking schools with social and psychosocial support services. Furthermore, NFSE centres should institutionalize support mechanisms by establishing structured mentorship programs, regular counselling services, and formal collaboration frameworks with social workers and community support agencies to ensure continuous academic and emotional support for teenage mothers.

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Rethinking Student Assessment in the Era of AI-Assisted Learning

A Case of Higher Learning Institutions in Tanzania

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Keywords

AI assisted learning, student assessment, higher education, Tanzania

Abstract

The rapid integration of artificial intelligence (AI) technologies in higher education is transforming teaching, learning, and assessment practices. Generative AI systems, such as ChatGPT and Google Gemini, enable students to generate ideas, summarize academic materials, and refine written work, challenging the validity of conventional assessments designed to measure independent intellectual effort. Despite this potential, limited research has explored how assessment can be reconceptualized to accommodate AI-assisted learning while maintaining academic rigor. This study addresses the question, how student assessment can be aligned with AI-mediated learning in higher education. Guided by Extended Mind Theory, which conceptualizes cognition as distributed across human and technological agents, the study examined assessment in Tanzanian higher learning institutions. Using a qualitative multiple case study design, data were collected from 68 participants through interviews, focus groups, open-ended questionnaires and document reviews. Thematic analysis revealed that students integrate AI tools as cognitive extensions, enhancing understanding, argumentation and metacognitive reflection, while lecturers noted benefits alongside challenges in evaluating independent learning. Emerging approaches including oral presentations, reflective journals, project-based tasks and AI-transparent reporting were identified as effective. The findings underscore the need for AI-inclusive assessment frameworks emphasizing process, reflection and critical engagement.

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1. Introduction

The rapid advancement of artificial intelligence (AI) technologies is transforming many sectors of society, including education (Luckin et al., 2016; Zawacki-Richter et al., 2019). In higher education, AI-powered technologies are increasingly integrated into teaching and learning processes, enabling new forms of knowledge production, academic support, and personalized learning (Holmes et al., 2019). The emergence of generative AI systems such as ChatGPT and Google Gemini has further accelerated this transformation by providing students with tools capable of generating text, summarizing academic materials, explaining complex concepts, and supporting academic writing (Dwivedi et al., 2023; Kasneci et al., 2023). As a result, AI is becoming an important component of contemporary digital learning environments in universities and other higher learning institutions (Zawacki-Richter et al., 2019).

Recent studies suggest that students are increasingly using AI-based tools to assist with a wide range of academic tasks, including brainstorming ideas, editing assignments, conducting preliminary research and improving the clarity of written work (Kasneci et al., 2023; Cotton et al., 2024). These technologies can enhance learning efficiency, expand access to information and support students in developing new academic skills (Holmes et al., 2019). Within the broader field of Artificial Intelligence in Education, scholars have emphasized that AI has the potential to significantly enhance learning experiences by supporting personalized learning, adaptive feedback and collaborative knowledge construction (Luckin et al., 2016; Holmes et al., 2019).

Despite these opportunities, the growing use of AI tools in academic work has generated significant debates regarding their implications for student assessment (Cotton et al., 2024; Dwivedi et al., 2023). Traditional assessment practices in higher education have historically been designed to evaluate students' independent intellectual efforts and mastery of course content (Boud & Falchikov, 2007). Common assessment methods such as essays, written assignments and take-home projects assume that the submitted work primarily reflects the student's own reasoning and analytical ability. However, the ability of generative AI tools to produce high-quality academic content

has challenged this assumption and raised important questions about the validity and reliability of conventional assessment methods (Kasneci et al., 2023; Cotton et al., 2024).

Scholars have increasingly pointed out that the presence of AI technologies in the learning process requires educators to reconsider the ways in which student learning is evaluated (Holmes et al., 2019; Zawacki-Richter et al., 2019). Rather than viewing AI solely as a threat to academic integrity, some researchers argue that it should be recognized as a new learning tool that can support knowledge development when used responsibly (Dwivedi et al., 2023). From this perspective, the challenge facing higher education institutions is not simply how to detect AI-generated work but how to redesign assessment practices that reflect the realities of AI-assisted learning while maintaining the authenticity of student learning outcomes (Cotton et al., 2024).

As AI technologies continue to evolve and become more accessible to students, universities/training institutions are increasingly confronted with the need to adapt their teaching and assessment strategies (Kasneci et al., 2023). This shift requires educators and policymakers to rethink traditional assessment models and explore innovative approaches that acknowledge the role of AI in contemporary academic work (Holmes et al., 2019). Understanding how assessment can be redesigned to accommodate AI-assisted learning is therefore an important issue for the future of higher education (Dwivedi et al., 2023).

The rapid integration of artificial intelligence (AI) technologies into higher education has significantly transformed how students engage with academic work (Kasneci et al., 2023). Generative AI tools, such as ChatGPT, allow students to generate ideas, draft assignments, summarize academic literature, and refine their writing with minimal effort (Dwivedi et al., 2023). While these tools offer potential benefits for enhancing learning and productivity, their increasing use has raised concerns regarding the effectiveness of traditional assessment methods in accurately measuring student learning outcomes (Cotton et al., 2024).

Conventional assessment practices in higher learning institutions, including written assignments, essays, and take-home projects, were designed to evaluate students' independent intellectual effort (Boud & Falchikov, 2007). However, the capacity of AI systems to produce high-quality academic responses makes it challenging for educators to determine whether submitted work reflects genuine understanding or AI-generated output (Kasneci et al., 2023). Consequently, questions about academic integrity, authenticity of learning, and the reliability of assessment outcomes have become increasingly prominent in contemporary educational discourse (Cotton et al., 2024).

In response, many institutions have emphasized detecting or restricting AI use in academic work. However, such measures may not fully address the underlying changes in the learning environment, as students are likely to continue incorporating AI into their study processes (Dwivedi et al., 2023; Holmes et al., 2019). Despite recognition of AI-assisted learning, there remains limited research on how assessment systems can be redesigned to accommodate AI while maintaining academic standards and ensuring meaningful learning outcomes (Zawacki-Richter et al., 2019; Cotton et al., 2024). This gap highlights the need for studies that explore alternative assessment approaches capable of recognizing AI-supported learning while ensuring that students demonstrate genuine understanding, critical thinking, and higher-order cognitive skills (Kasneci et al., 2023).

Research Question

To examine how student assessment can be rethought in the era of AI-assisted learning in higher education and how student assessment can be aligned with AI-mediated learning in higher education.

2. Theoretical Framework

This study is guided by the Extended Mind Theory, originally proposed by Andy Clark and David Chalmers in 1998 (Clark & Chalmers, 1998). The theory challenges traditional views of cognition by suggesting that human thinking is not limited to processes occurring within the brain but can extend to external tools and technologies that support cognitive activities. According to this perspective, when individuals rely on technological systems to perform cognitive tasks such as remembering, reasoning or problem solving, those technologies effectively become part of the cognitive system itself (Clark & Chalmers, 1998; Clark, 2008).

In educational contexts, the Extended Mind Theory provides a useful framework for understanding how digital technologies support learning processes (Clark, 2008; Selwyn, 2016). Modern learning environments increasingly incorporate technological tools that assist students in organizing information, analyzing ideas and producing knowledge. When students interact with such technologies, the boundary between human cognition and technological assistance becomes increasingly blurred. Rather than replacing human thinking, these tools function as cognitive extensions that enhance students' ability to process information and construct knowledge (Clark, 2008).

The emergence of generative artificial intelligence technologies has further expanded the relevance of this theoretical perspective in education (Kasneci et al., 2023; Dwivedi et al., 2023). AI-powered systems such as ChatGPT and Google Gemini are capable of generating explanations, summarizing information, suggesting ideas and assisting with academic writing. These capabilities enable students to engage in complex intellectual tasks with the support of intelligent digital systems. Within the framework of the Extended Mind Theory, such AI systems can be understood as cognitive partners that extend students' intellectual capacities rather than simply functioning as external tools (Clark, 2008; Kasneci et al., 2023).

This theoretical perspective has important implications for how learning and assessment are conceptualized in higher education. Traditional assessment models are generally based on the assumption that students complete academic tasks independently and that submitted work represents the individual's unaided cognitive effort (Boud & Falchikov, 2007). However, if technological tools are considered legitimate extensions of human cognition, then the strict separation between individual intellectual effort and technological assistance becomes difficult to maintain (Clark, 2008). In AI-assisted learning environments, students often interact with digital systems as part of their thinking processes, using them to refine ideas, explore alternative perspectives and improve the clarity of their academic work (Kasneci et al., 2023).

From the perspective of the Extended Mind Theory, the presence of AI technologies in learning environments does not necessarily undermine student learning. Instead, it reflects the evolving nature of cognition in technologically mediated contexts (Clark, 2008; Selwyn, 2016). Consequently, educational practices, including assessment systems, may need to adapt to recognize how students interact with technological tools in the process of knowledge construction. Rather than focusing exclusively on detecting AI-generated content, educators may need to design assessment approaches that evaluate students' ability to critically engage with AI-generated information, integrate technological support into their learning processes and demonstrate meaningful understanding of academic concepts (Dwivedi et al., 2023).

By applying the Extended Mind Theory, this study seeks to conceptualize AI not merely as a source of academic misconduct but as a potential component of contemporary cognitive systems within higher education. This perspective provides a theoretical basis for rethinking student assessment practices in ways that acknowledge the role of AI in supporting learning while still ensuring that students demonstrate genuine intellectual engagement and critical thinking (Kasneci et al., 2023).

3. Methodology

This study adopted a qualitative research approach to explore how student assessment can be rethought in the era of AI-assisted learning in higher education. A qualitative approach was deemed appropriate for capturing the lived experiences, perceptions and practices of participants within their natural academic contexts (Creswell & Poth, 2018; Denzin & Lincoln, 2018). This approach enabled in-depth exploration of how students and educators engage with generative AI tools, such as ChatGPT and Google Gemini, during academic tasks and assessment processes, generating rich, context-specific insights into AI-assisted learning practices (Merriam & Tisdell, 2016).

A multiple case study design was employed, involving five higher learning institutions across three regions of Tanzania: Arusha, Dodoma, and Dar es Salaam. The institutions were purposively selected to reflect diverse academic programs, pedagogical approaches and institutional types, including two universities regulated by the Tanzania Commission for Universities and three training institutions under the National Council for Technical and Vocational Education and Training (NCTVET). This design facilitated cross-case comparison, enabling the study to identify both common patterns and contextual differences in how AI tools influence student learning and assessment (Stake, 2006; Yin, 2018).

The study population comprised lecturers and undergraduate students actively engaged in teaching, learning and assessment. Purposive sampling was applied to select participants with direct experience in AI-assisted learning and assessment processes (Creswell & Poth, 2018; Patton, 2015). A total of 68 participants were included: 25 lecturers (five per institution) and 60 students (12 per institution), representing programs where AI-supported academic activities were common. This dual perspective allowed for a comprehensive understanding of AI's role in shaping assessment practices.

Data were collected using semi-structured interviews with lecturers, focus group discussions with students, open-ended questionnaires to lecturers and students and institutional document review. Interviews and focus groups elicited detailed narratives regarding AI use, while documents provided triangulation by capturing formal policies, assessment guidelines and course structures (Bowen, 2009; Kvale & Brinkmann, 2015; Krueger & Casey, 2015). Open-ended questionnaires complemented these methods by enabling lecturers and students to elaborate on their experiences at their own pace, ensuring broad coverage across institutions.

The collected data were analyzed using thematic analysis, which involved iterative coding to identify patterns and synthesize overarching themes (Braun & Clarke, 2021; Saldaña, 2021). Analysis stages included data familiarization, open coding, theme development, integration with the Extended Mind Theory framework (Clark & Chalmers, 1998), and triangulation across data sources. This process allowed the study to critically interpret how AI functions as a cognitive extension in learning and assessment contexts, ensuring robust and theory informed findings.

Trustworthiness was ensured through credibility, dependability, confirmability and transferability strategies (Krueger & Casey, 2015). Credibility was enhanced via triangulation and member checking, dependability through an audit trail of methodological steps, confirmability through reflexive documentation and transferability by providing rich contextual descriptions.

Ethical considerations were strictly observed. Approval was obtained from relevant institutional authorities and participants provided informed consent. Confidentiality and anonymity were maintained through coded identifiers and participants were informed of their right to withdraw at any stage without consequences.

4. Findings and Discussion

Patterns of AI Use in Academic Work

The findings indicate that students are progressively integrating artificial intelligence tools into their academic activities, reflecting a sophisticated and strategic engagement with emerging technologies. Participants reported frequent use of generative AI systems such as ChatGPT and Google Gemini for assignment preparation, idea generation, summarization of academic materials and enhancing the clarity and structure of written work. Students emphasized that these tools provide immediate cognitive scaffolding, enabling them to clarify complex concepts, organize their thoughts and refine arguments during independent study. Several participants also highlighted AI's role in editing grammar and improving academic language, suggesting that these technologies are increasingly perceived as cognitive partners rather than mere informational resources.

Lecturers corroborated these observations, noting measurable improvements in the coherence, logic and organization of students' submissions. While some expressed concern regarding potential overreliance on AI, many acknowledged that AI supported tools have become an integral component of contemporary learning strategies, facilitating iterative refinement and deeper engagement with academic content. These findings align with prior empirical work highlighting AI's capacity to provide timely feedback, generate summaries and scaffold complex cognitive tasks, thereby enhancing student engagement and efficiency in knowledge construction (Holmes et al., 2019; Kasneci et al., 2023; Cotton et al., 2024).

From a theoretical perspective, this pattern of AI adoption resonates strongly with the Extended Mind Theory, which posits that cognition can extend beyond the biological mind to encompass tools and technologies that mediate thinking and reasoning (Clark & Chalmers, 1998; Clark, 2008). In this context, AI tools function as cognitive extensions, allowing students to externalize ideas, manipulate knowledge structures and scaffold higher-order thinking processes. The findings underscore that AI is not a passive

instrument but an active participant in intellectual workflows, effectively becoming embedded within students' cognitive ecosystems. This supports earlier assertions that interactions with AI systems blur the boundaries between human cognition and technological assistance, necessitating a reconceptualization of learning and assessment paradigms to accommodate mediated cognitive processes (Selwyn, 2016; Dwivedi et al., 2023).

Moreover, the study extends existing literature by highlighting the contextual nuance in AI integration. Beyond efficiency and task completion, students actively use AI to support higher-order cognitive functions such as synthesis, argumentation, and meta-cognitive reflection a dimension underexplored in previous research (Luckin et al., 2016; Holmes et al., 2019; Kasneci et al., 2023). This indicates that AI contributes not only to academic performance but also to the development of students' critical thinking and self-regulated learning capacities. At the same time, these findings challenge traditional assessment models, which assume independent intellectual effort as the primary marker of learning. As the Extended Mind framework suggests, outputs produced with AI assistance may still reflect authentic cognitive engagement, yet conventional assessment often fails to recognize mediated knowledge work (Clark, 2008; Boud & Falchikov, 2007). This underscores the urgent need for higher education institutions to reimagine assessment frameworks shifting from output-focused measures toward strategies that evaluate students' critical engagement with AI-generated content, synthesis abilities and conceptual understanding within technologically augmented learning environments (Dwivedi et al., 2023; Cotton et al., 2024).

Therefore, AI tools are increasingly embedded in students' academic practices, functioning as extensions of cognition that enhance idea generation, argument refinement, and conceptual clarity. These findings emphasize both the theoretical and practical imperative for assessment systems to acknowledge AI-assisted learning as an authentic and integral component of contemporary higher education.

Challenges Posed by AI to Traditional Assessment Practices

The findings reveal that the widespread integration of AI technologies in higher education poses profound challenges to conventional assessment practices. Lecturers consistently reported that traditional evaluation methods particularly essays, take home assignments and written projects may no longer reliably capture students' independent intellectual capabilities. Participants emphasized that generative AI systems, such as ChatGPT and Google Gemini, can produce academically coherent, well-structured and polished outputs, complicating efforts to discern whether submitted work reflects authentic student understanding or AI-mediated production (Kasneci et al., 2023; Cotton et al., 2024). This blurring of authorship raises critical questions about the validity of assessments designed under assumptions of independent cognitive labor.

These challenges are further exacerbated by the fact that existing academic integrity policies and assessment guidelines were developed prior to the proliferation of AI in higher education. Lecturers observed that current frameworks inadequately address the complexities introduced by AI-assisted learning, leaving them with limited tools to evaluate originality, authenticity and cognitive engagement. These observations resonate with prior studies suggesting that conventional assessments, which presume unmediated intellectual effort, may fail to capture meaningful learning outcomes in technologically augmented environments (Dwivedi et al., 2023; Holmes et al., 2019).

From the perspective of the Extended Mind Theory, these challenges reflect a fundamental transformation in the nature of cognition within AI-rich learning environments. As posited by Clark and Chalmers (1998) and Clark (2008), cognitive processes extend beyond the individual to incorporate tools and technologies that actively participate in reasoning, problem-solving and knowledge construction. In this context, AI systems are not passive instruments but cognitive partners, shaping how students conceptualize, structure and communicate knowledge. Consequently, assessment models predicated on purely independent intellectual production risk misrepresenting the distributed and technologically mediated character of contemporary student learning (Selwyn, 2016; Dwivedi et al., 2023).

The findings also underscore the limitations of traditional assessment approaches in evaluating higher-order cognitive skills. Boud and Falchikov (2007) argue that assessments focused on content reproduction inadequately capture critical thinking, synthesis and reflective reasoning. The present study extends this critique by showing that AI integration intensifies these limitations: students can generate academically credible outputs with minimal demonstration of the underlying cognitive processes that conventional assessments aim to measure (Kasneci et al., 2023; Cotton et al., 2024). Lecturers' reflections suggest an urgent need to re-conceptualize assessment reliability and validity, shifting from a narrow focus on originality toward frameworks that evaluate students' capacity to critically engage with AI-generated content, integrate knowledge coherently and demonstrate conceptual understanding (Dwivedi et al., 2023; Holmes et al., 2019).

Therefore, the study confirms that AI technologies challenge the assumptions underpinning traditional assessment models. Grounded in the Extended Mind framework, these challenges are not anomalies but natural consequences of cognition becoming distributed across human and technological agents. Addressing these challenges requires higher education institutions to rethink assessment strategies, emphasizing evaluation of critical engagement, synthesis and reflective learning in AI-supported academic contexts. Such re-conceptualization is essential to ensure that assessment remains both valid and meaningful in an era of technologically augmented cognition.

Students' Perceptions of AI as a Learning Support Tool

The findings indicate that students predominantly perceive AI technologies as supportive instruments that enhance engagement with academic content and facilitate more efficient completion of learning tasks. Participants reported that generative AI systems, including ChatGPT and Google Gemini, enable them to explore multiple explanations for complex concepts, access illustrative examples that clarify abstract theories and obtain near immediate feedback when tackling assignments. Many students emphasized that these tools help them overcome learning barriers, particularly when confronted with dense academic texts or unfamiliar disciplinary content (Kasneci et al., 2023; Dwivedi et al., 2023). This suggests that AI is experienced as an active scaffold for learning rather than a passive informational resource.

Critically, students acknowledged the need for evaluative engagement with AI-generated content. While AI can produce coherent, well-organized outputs, participants reported instances of inaccuracy, overgeneralization, or contextual misalignment. Consequently, students described actively scrutinizing AI outputs, integrating them selectively into their reasoning processes and cross verifying information through independent study. This reflective engagement indicates that students view AI as a complementary cognitive partner, supporting but not replacing their own intellectual efforts (Holmes et al., 2019; Cotton et al., 2024). Such judicious use exemplifies how learners maintain agency and critical oversight in AI-mediated academic tasks.

From a theoretical standpoint, these perceptions resonate with the Extended Mind Theory, which conceptualizes cognitive processes as extending beyond the biological mind to include tools that actively participate in reasoning and knowledge construction (Clark & Chalmers, 1998; Clark, 2008). In this context, AI technologies function as external cognitive supports that structure ideas, mediate access to information and provide iterative guidance. By integrating AI into their cognitive workflows, students can engage in more sophisticated learning strategies, enhancing argumentation, synthesis and reflective thinking in ways not possible through unaided cognition alone (Selwyn, 2016; Dwivedi et al., 2023).

Empirically, the findings extend prior literature on AI-assisted learning by highlighting the meta-cognitive dimension of student engagement. While previous studies emphasize AI’s role in content generation and task efficiency (Luckin et al., 2016; Holmes et al., 2019), the current study demonstrates that students actively evaluate the reliability of AI outputs, exercising judgment and reflective reasoning. This suggests that AI’s educational value is realized not merely through information provision but through its capacity to support critical reflection, problem-solving and knowledge integration (Kasneci et al., 2023; Cotton et al., 2024). Importantly, these findings challenge traditional assessment assumptions, which often regard tool assisted outputs as indicative of diminished independent learning. Within AI-mediated environments, assessment frameworks must recognize that cognitive performance can legitimately include collaboration with technological systems. Evaluations that capture students’ ability to critically leverage AI,

synthesize information and appraise outputs are more likely to reflect authentic learning in contemporary higher education (Dwivedi et al., 2023; Holmes et al., 2019).

So the current study demonstrates that students generally regard AI technologies as constructive extensions of their cognitive processes. AI serves as a scaffold for understanding, reflection and the development of higher-order academic skills. These findings underscore the imperative for pedagogical and assessment practices that acknowledge AI-assisted cognition, ensuring that evaluation systems capture genuine intellectual engagement within digitally augmented learning environments.

Emerging Approaches for AI-Inclusive Assessment

The findings indicate that reimagining assessment in AI-mediated learning requires a paradigmatic shift from traditional, output-centric approaches toward interactive, process oriented and reflective evaluation methods. Participants emphasized the potential of strategies such as oral presentations, in-class assessments, project-based tasks and reflective assignments that compel students to articulate their reasoning and decision-making processes. These methods provide educators with richer insight into conceptual understanding, critical thinking and problem-solving capabilities, while accommodating AI as a cognitive scaffold rather than a substitute for intellectual effort (Dwivedi et al., 2023; Bearman et al., 2020).

Transparency in AI use emerged as a critical principle. Lecturers suggested that students should explicitly report how AI tools contributed to their assignments, including how generated outputs were evaluated, synthesized and refined. This approach reframes AI from a potential threat to academic integrity into an integral component of the learning process, fostering accountability, reflective practice and responsible technology engagement. Empirical studies corroborate this perspective, emphasizing that students' ability to critically integrate AI-generated content into original work is central to maintaining scholarly rigor (Dwivedi et al., 2023; Long & Magerko, 2020).

Theoretically, these emerging assessment practices align closely with the Extended Mind Theory, which conceptualizes cognition as distributed across human and technological agents (Clark & Chalmers, 1998; Clark, 2008). AI

tools, when recognized in assessment design, are not penalized but treated as extensions of cognitive capacity, enabling richer demonstrations of understanding. Oral, reflective and process-oriented assessments capture how students navigate, interpret and integrate AI-assisted knowledge, reflecting the distributed and interactive nature of contemporary learning (Selwyn, 2016; Kasneci et al., 2023). By making AI's role explicit, these assessments evaluate students' higher-order cognitive engagement rather than merely the correctness or originality of outputs.

Critically, AI-inclusive assessment addresses limitations inherent in traditional evaluation models, which assume independent cognition and often fail to measure complex, contextually mediated learning. Process focused assessments encourage students to demonstrate critical thinking, synthesis, creativity and ethical decision-making while situating AI as a functional learning partner (Cotton et al., 2024; Holmes et al., 2019; Luckin et al., 2016). Beyond being a corrective response to AI misuse, this shift represents a strategic pedagogical opportunity: it fosters metacognition, ethical engagement with technology and reflective learning practices. Assessment thus evolves from a static measure of memorization or content reproduction to a dynamic evaluation of students' ability to integrate external cognitive supports into authentic intellectual work (Kasneci et al., 2023; Dwivedi et al., 2023).

Therefore, the study positions AI-inclusive assessment as both a theoretical and practical imperative. Grounded in the Extended Mind framework, these strategies emphasize transparency, reflection and process oriented evaluation, acknowledging AI as an active participant in students' cognitive processes. By re-conceptualizing assessment to capture mediated learning, higher education institutions can achieve more valid, reliable and meaningful measures of student understanding in digitally augmented academic environments.

5. Conclusion

The integration of AI technologies into higher education is fundamentally reshaping the landscape of learning, cognition and assessment, challenging entrenched assumptions about independent intellectual effort. This study

demonstrates that AI is not merely a peripheral tool but a functional extension of students' cognitive processes, actively participating in knowledge construction, synthesis and communication. Such a transformation necessitates a reconceptualization of assessment paradigms, moving beyond output-focused measures toward approaches that capture distributed cognition, reflective engagement and critical interaction with technological supports.

Traditional assessment methods, which prioritize isolated intellectual effort, are increasingly misaligned with the realities of AI-mediated learning. This misalignment underscores the need for assessment frameworks that legitimately recognize AI as a cognitive partner, while simultaneously maintaining rigorous academic standards. Effective evaluation in AI-rich environments should therefore assess students' capacity to critically engage with AI outputs, synthesize information and demonstrate conceptual understanding and higher-order thinking skills. Failure to adapt assessment strategies risks misrepresenting student learning and underestimating the cognitive complexity involved in AI-supported academic work.

In response, higher education institutions are encouraged to adopt AI-inclusive assessment strategies that foreground transparency, reflective practice and process-oriented evaluation. Practical measures include oral examinations, project-based tasks, reflective journals and in-class assessments that require students to articulate their reasoning and describe how AI tools were employed to support their work. These approaches enable educators to evaluate both cognitive engagement and ethical, responsible use of AI, transforming assessment from a test of memorization into a measure of metacognition, critical thinking and technological literacy.

Ultimately, integrating AI-aware practices into assessment frameworks preserves academic integrity while fostering 21st-century competencies aligned with digitally mediated learning environments. By recognizing AI as an integral component of contemporary cognition, higher education institutions can ensure that evaluation is valid, reliable and meaningful, preparing students not only to excel academically but also to navigate complex, technology-enhanced professional and societal contexts. This study contributes to the theoretical and practical discourse on AI in education,

providing a foundation for policies and pedagogical innovations that align assessment with the evolving realities of AI-assisted learning.

Future studies may further explore how emerging AI-inclusive assessment approaches can be effectively implemented and managed in large classes within higher education institutions. Given that many universities and training institutions operate with high student-lecturer ratios, further research is needed to identify practical strategies, technological support mechanisms and institutional frameworks that enable lecturers to apply reflective, process-oriented and AI-aware assessment models while maintaining reliability, fairness and academic rigor.

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7. Short biography

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From Scaffolding to Autonomy

A Theoretical Analysis of Postgraduate Supervision
through Self-Determination and Zone of Proximal Development
Theories

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July 2026.

Keywords

Postgraduate supervision, self-determination theory, zone of proximal development, postgraduate productivity, graduation outcomes, management and ethics in higher education.

Abstract

Postgraduate supervision is a critical determinant of research productivity. In South Africa, persistent challenges, including extended time-to-degree, uneven postgraduate throughput, and variable supervision quality, continue to undermine the contribution of postgraduate education to national development and research capacity. The study is theoretically grounded in Vygotsky's Zone of Proximal Development (ZPD) and Self-Determination Theory (SDT), which together provide a complementary developmental and motivational lens for analysing postgraduate supervision. The Zone of Proximal Development explains how scaffolded academic support enables students to perform beyond their current capabilities. At the same time, Self-Determination Theory elucidates how the fulfilment of autonomy, competence, and relatedness sustains motivation and persistence. Using a conceptual research design, the study conducted a systematic and integrative review of 68 peer-reviewed scholarly sources published between 2015 and 2024, sourced primarily from Google Scholar and Scopus-indexed journals. The study proposes a conceptual framework that positions supervision as a developmental continuum, beginning with intensive, ZPD-informed scaffolding and progressively shifting towards autonomy-supportive supervision as students' research competence increases. The framework illustrates how adaptive supervisory practices mediate motivation and learning, enabling postgraduate students to develop confidence, independence, and a strong scholarly identity. This study reconceptualises postgraduate supervision by integrating developmental learning theory and motivational psychology. It argues that supervision progressing from scaffolding to autonomy strengthens postgraduate education and research capacity in South African higher education institutions.

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1. Introduction and Background

Postgraduate education remains a strategic priority for higher education systems worldwide, particularly in the knowledge economy, where advanced research skills, innovation capacity, and doctoral-level expertise are increasingly essential (OECD 2021). In South Africa, postgraduate education plays a crucial role in addressing national development priorities, enhancing research output, and promoting transformation in historically disadvantaged institutions (Department of Higher Education and Training [DHET], 2020). Despite sustained growth in postgraduate enrolments, concerns persist regarding low completion rates, prolonged time-to-degree, and uneven research productivity across universities (CHE 2022).

Recent studies consistently identify postgraduate supervision as one of the most significant determinants of postgraduate success, productivity, and timely graduation (Huet and Casanova, 2022; Crofford et al. 2025). Adequate supervision is now understood as a complex pedagogical and relational practice that extends beyond technical research guidance to include motivational support, academic socialisation, emotional intelligence, and the deliberate development of scholarly independence (Bastalich, 2017; Ofem et al, 2025). However, supervision practices in many universities remain uneven and highly individualised, often lacking a coherent theoretical foundation to guide supervisory decision-making (Kumar and Bolliger, 2025).

Many postgraduate students require structured academic support, particularly in the early stages of candidature. However, excessive supervisory control may foster dependency, while insufficient guidance can leave students academically isolated and at risk of delayed completion or attrition (Crofford et al. 2025). This tension highlights the need for supervision approaches that balance developmental support with the cultivation of autonomy.

Similarly, Vygotsky's Zone of Proximal Development (ZPD) remains highly relevant in contemporary supervision discourse, particularly in relation to scaffolding and developmental progression (Shabani et al. 2019). ZPD emphasises that learning is optimised when supervisors provide structured, responsive support that is gradually withdrawn as competence develops.

When applied to postgraduate supervision, ZPD offers a conceptual basis for aligning supervisory input with students’ evolving research capabilities, thereby facilitating the transition from guided learning to independent scholarship.

Introduction

Postgraduate supervision has become a focal concern in higher education due to increasing institutional pressure to improve research outputs, enhance throughput, and reduce time-to-degree. Universities are expected not only to enrol postgraduate students but also to ensure their timely graduation and effective integration into scholarly and professional communities (OECD, 2021). In South Africa, these expectations are reinforced by funding frameworks and performance indicators that link postgraduate completions and research productivity to institutional sustainability and national development goals (DHET, 2020; CHE, 2022). However, postgraduate completion rates remain inconsistent, with many students experiencing extended candidature periods or failing to complete their studies.

Recent research highlights that the quality of supervision plays a crucial role in shaping the motivation, engagement, and academic progress of postgraduate students (Huet & Casanova, 2022; Ofem et al, 2025). Adaptive guidance, negotiated expectations, timely feedback, and the intentional development of independence increasingly characterise adequate supervision. Nonetheless, many supervision practices remain rooted in traditional master–apprentice models that may not adequately respond to the diverse needs of contemporary postgraduate cohorts (Kumar & Bolliger, 2025). The absence of explicit theoretical grounding often results in inconsistent supervision practices that undermine student productivity and delay graduation.

This study addresses this gap by providing a theoretical analysis of postgraduate supervision through the integrated lenses of Self-Determination Theory (SDT) and the (ZPD). Conceptually, the study positions postgraduate supervision as a developmental continuum that moves deliberately from scaffolding to autonomy. Drawing on Self-Determination Theory, the study

argues that postgraduate productivity and graduation outcomes are enhanced when supervision practices actively support student autonomy, foster research competence, and nurture constructive relationships between supervisors and students (Ryan & Deci, 2020). Motivation, persistence, and research engagement are strengthened when students experience ownership of their research and confidence in their scholarly abilities (Jeno et al., 2018).

At the same time, the ZPD offers a complementary developmental lens, explaining how supervisors can calibrate the level of academic support they provide. Scaffolding within the ZPD enables students to acquire complex research skills through guided practice, feedback, and modelling, with supervisory support gradually withdrawn as independence increases (Shabani et al., 2019). This balance is particularly critical in South African universities, where postgraduate students often enter with varying levels of research preparedness and differing exposure to academic research cultures (Kreber, 2023).

The aim of this study is therefore to enhance postgraduate productivity and graduation outcomes in South African universities by advancing a theoretically grounded understanding of adequate supervision. By integrating SDT and the ZPD, the study contributes to contemporary debates on postgraduate supervision. It offers a developmental framework that can inform supervisory practice, academic staff development, and institutional policy. Ultimately, the study argues that supervision which intentionally transitions from structured scaffolding to autonomous scholarly engagement is essential for producing competent, motivated, and independent postgraduate graduates.

Problem Statement

Globally, postgraduate education is widely recognised as a critical driver of research productivity, innovation, and human capital development in higher education institutions. In South Africa, postgraduate training is a central component of national priorities, including transformation, skills development, and strengthening the country's research and innovation system (Department of Higher Education and Training [DHET] 2020). Despite

sustained growth in postgraduate enrolments, South African universities continue to face persistent challenges, including low completion rates, extended time-to-degree, and uneven postgraduate research productivity across institutions and disciplines (Namakula and Ndaba 2024; Council on Higher Education [CHE] 2022). These challenges undermine institutional performance, strain supervisory capacity, and weaken the overall contribution of postgraduate education to national development goals.

A growing body of contemporary research identifies the quality of postgraduate supervision as one of the most significant determinants of postgraduate productivity and graduation outcomes (Crofford et al. 2025). While supervision is expected to provide intellectual guidance, methodological support, and academic socialisation, many postgraduate students report unclear expectations, inconsistent feedback, inadequate developmental support, and limited opportunities to cultivate independent research competence (Ofem et al. 2025). In such contexts, supervision often becomes reactive and compliance-driven rather than developmental and pedagogically informed, which can contribute to delayed progress and non-completion.

Kreber (2023) emphasised that the postgraduate environment in South Africa exacerbates this issue due to considerable differences in students' academic readiness, prior research exposure, and the availability of institutional resources, including access to research funding, digital infrastructure, academic writing support, library databases, research software, experienced supervisors, and postgraduate development programmes. Many postgraduate students require structured academic scaffolding, particularly in the early stages of candidature. However, overly directive supervision can foster dependency and inhibit the development of autonomy, while insufficient or poorly timed support may leave students academically isolated and vulnerable to attrition (Crofford et al 2025). This tension highlights a fundamental problem in postgraduate supervision: how to balance structured support with the intentional development of independent scholarly capability.

Although theoretical perspectives such as SDT and the ZPD offer robust explanations for motivation, learning, and developmental progression, their

systematic application to postgraduate supervision remains limited in the South African higher education context. SDT emphasises autonomy, competence, and relatedness as key drivers of sustained motivation and performance (Ryan and Deci 2020), while the ZPD underscores the importance of calibrated scaffolding that is gradually withdrawn as competence develops (Shabani, Khatib and Ebadi 2019). The absence of theoretically grounded supervision frameworks that integrate these perspectives contributes to inconsistent supervisory practices and limits the effectiveness of interventions to improve postgraduate productivity and graduation rates.

The core problem addressed by this study, therefore, is the lack of a coherent, theory-driven understanding of postgraduate supervision that deliberately supports the transition from scaffolding to autonomy. Without such an approach, postgraduate students in South African universities remain at risk of delayed completion, reduced research productivity, and diminished academic confidence. This study seeks to address this gap by providing a theoretical analysis of postgraduate supervision grounded in SDT and the ZPD, to inform supervision practices that enhance postgraduate productivity and graduation outcomes in South African higher education institutions.

2. Aim of the Study

This study aims to enhance postgraduate productivity and graduation outcomes in South African universities by developing a theoretically grounded understanding of adequate supervision. Specifically, the study applies SDT and the ZPD to conceptualise supervision as a developmental process that transitions from structured scaffolding to autonomous scholarly engagement.

Methodology

This study employed a conceptual research design, appropriate for synthesising existing knowledge and building theoretical insights rather than collecting empirical data. Conceptual research is widely recognised as a method for advancing theory and clarifying complex phenomena in higher

education scholarship (Adeniran and Tayo-Ladega 2024). The methodological process began with a systematic examination of academic literature using Google Scholar and Scopus-indexed sources to identify relevant literature on postgraduate supervision, SDT, and ZPD. Postgraduate completion guided the search, resulting in the selection of 68 peer-reviewed journal articles, books, and reports published between 2015 and 2025. This timeframe ensured coverage of the most recent developments in supervision theory and postgraduate education research.

The selected literature was analysed using an integrative and thematic synthesis approach, which is particularly effective for conceptual studies aiming to generate new models or frameworks based on existing evidence (Adeniran and Tayo-Ladega 2024; Juárez 2025). This involved identifying key concepts and theoretical contributions relating to ZPD and SDT, comparing how each has been applied in the context of postgraduate learning, and critically interpreting their intersections. Through iterative review and mapping of the literature, themes of scaffolding, autonomy, motivational support, and developmental progression emerged as central constructs. The synthesis enabled the development of a coherent conceptual model that articulates how postgraduate supervision can move deliberately from structured support to autonomous research engagement. This method ensured theoretical rigour and clarity, grounding the model in current scholarly discourse while offering a meaningful contribution to understanding postgraduate supervision practice.

Postgraduate Productivity and Graduation Challenges in South Africa

In a South African study, Saidi (2024) highlighted that Postgraduate education in South Africa faces challenges that hinder graduation rates and productivity. Improving the quality of supervision is essential for increasing completion rates among postgraduate students. Research indicates that insufficient supervisory support leads to longer graduation times and higher student attrition rates (Mofolo and Lukman 2024). This situation is exacerbated by inadequate supervisory structures present in many universities, which limit students' engagement and hinder their academic

progress (Nxumalo 2025). Consequently, institutions need to establish structured and effective supervisory practices to improve student outcomes and productivity.

Additionally, the administrative burden associated with postgraduate studies represents a substantial hurdle for many students in South Africa. Institutional frameworks often fail to provide the necessary support for students navigating the complexities of thesis and dissertation writing (Aggabao 2025). A study revealed that students often report feelings of isolation and a lack of assistance, which further exacerbates their challenges (Aggabao 2025). Access to research support services, coupled with inadequate training in research methodology, significantly hampers students' ability to complete their degrees promptly (Aggabao 2025). Therefore, addressing these administrative challenges is crucial to improving the overall completion rates of postgraduate programs.

Moreover, the psychosocial environment surrounding postgraduate students in South African universities also contributes to the challenges of graduation. Factors such as mental health issues, stress, and financial instability create barriers to effective learning and completion of studies (Paruk et al. 2023). The COVID-19 pandemic has amplified these issues by adding another layer of uncertainty and disruption, leading to increased psychological distress among students (Paruk et al. 2023). In addition, many students face societal pressures that further hinder their academic performance, necessitating mental health support systems and financial assistance programs to foster a conducive learning environment.

Lastly, addressing deficiencies in educational infrastructure and creating a supportive academic culture is imperative for improving postgraduate productivity in South Africa. Institutions must prioritise the development of a robust research culture characterised by interdisciplinary collaboration and accessible resources. By fostering an environment conducive to learning and innovation, universities can cultivate a generation of graduates better equipped to meet the demands of the workforce (Muasya 2025). Implementing targeted initiatives, such as seminar workshops for skill enhancement and access to databases, can significantly aid in overcoming

existing barriers students face (Aggabao 2025). A collaborative approach that engages faculty, administration, and students will be vital in enhancing the postgraduate educational experience in South Africa.

3. Theoretical Foundations of the Study

This study is grounded in the understanding that postgraduate supervision is both a motivational and developmental process that directly shapes students’ research productivity, persistence, and graduation outcomes. The theoretical foundation draws primarily on SDT and Vygotsky’s ZPD to explain how supervision can effectively support postgraduate students’ academic progression in higher education. These theories are particularly relevant in contemporary university contexts, where postgraduate cohorts are increasingly diverse in terms of academic awareness, socio-economic background, and research experience. Together, SDT and ZPD provide a robust explanatory lens for understanding how supervision practices can foster motivation, competence, and independence, while also offering structured support that is responsive to students’ evolving capabilities (Ryan and Deci 2020; Shabani et al. 2019).

SDT emphasises autonomy, competence, and relatedness as essential psychological needs that underpin sustained motivation and high performance in learning environments. Within postgraduate supervision, SDT emphasises the importance of supervisory practices that foster student ownership of research, develop confidence in scholarly skills, and cultivate supportive supervisor–student relationships. Complementing this motivational perspective, the ZPD focuses on the developmental role of scaffolding, in which supervisors provide targeted guidance that enables students to perform beyond their current level of competence, gradually withdrawing support as students achieve independence. When integrated, SDT and ZPD conceptualise postgraduate supervision as a dynamic progression from guided learning to autonomous scholarship. This theoretical integration is particularly suited to the South African higher education context, where enhancing postgraduate productivity and graduation outcomes

requires supervision models that are both developmentally sensitive and motivation-enhancing.

Self-Determination Theory and Postgraduate Supervision

The SDT, initially formulated by Edward Deci and Richard Ryan in the mid-1970s, provides a vital framework for understanding motivation in educational settings, particularly in the context of postgraduate supervision. The theory posits that human motivation is driven by the fulfilment of three basic psychological needs: autonomy, competence, and relatedness. These needs, when satisfied, not only enhance intrinsic motivation but also improve psychological well-being (Sanguinetti 2023). This foundation has significant implications for postgraduate education, where the supervisory relationship can either facilitate or hinder the fulfilment of these motivational needs, thereby impacting students' academic performance and overall satisfaction.

The fundamental principles of SDT indicate that autonomy relates to the feeling of volition and self-endorsement in one's actions, competence pertains to the sense of effectiveness and skilfulness in a given context, and relatedness concerns the sense of belonging and connection with others (Rasul and Schwaiger 2023). For postgraduate students, particularly in research-intensive environments, the interplay of these components becomes crucial. Effective supervisors need to create an environment that nurtures students' autonomy by providing opportunities for independent thought and decision-making, thereby fostering a sense of ownership over their research projects. Furthermore, by offering constructive feedback and support, supervisors can help students develop their competencies, thus enhancing their confidence and motivation (Mak 2021). When students perceive that their supervisors genuinely care for their success and well-being, it amplifies feelings of relatedness, which can significantly boost their intrinsic motivation to engage with their studies (Rasul and Schwaiger 2023).

Moreover, when SDT is applied to the study of postgraduate supervision, these principles can be directly linked to enhanced academic outcomes. Research indicates that a learning climate that satisfies the psychological needs promotes higher intrinsic motivation among students, which in turn

leads to improved academic performance and greater psychological well-being (Rasul and Schwaiger 2023). For instance, in the context of postgraduate research, students who feel a strong sense of autonomy in deciding their research directions are likely to demonstrate higher levels of engagement, creativity, and commitment to their work. Conversely, if supervisors adopt a more controlling or prescriptive approach, it may inhibit students' intrinsic motivation, potentially leading to adverse outcomes, such as attrition or disengagement (Craig et al. 2023). Thus, adopting an SDT-informed supervisory style is crucial not only for enhancing motivation but also for ensuring that students successfully navigate the challenges inherent to postgraduate studies.

Moreover, incorporating SDT into postgraduate supervision practices can significantly enhance student motivation and academic success. Fostering an environment that emphasises autonomy, competence, and relatedness, supervisors may bolster students' intrinsic motivation, leading to increased satisfaction and improved academic outcomes. Engaging students in their educational journeys and supporting their psychological needs will ultimately cultivate a more productive and fulfilling postgraduate experience, which is paramount for developing capable, autonomous researchers in academia (Murphy et al. 2021). Hence, integrating SDT principles into postgraduate supervision models can be an effective strategy to enhance the educational experience, ultimately benefiting both supervisors and supervisees.

Zone of Proximal Development and Scaffolding in Supervision

The ZPD, a concept introduced by Lev Vygotsky in the early 20th century, is central to understanding the dynamics of learning and development. ZPD refers to the range of abilities that a student can perform with the guidance of a more knowledgeable person but cannot yet manage independently. This theory posits that effective learning occurs within this zone, where learners receive appropriate support, or "scaffolding," from instructors or peers, enabling them to develop new skills and knowledge. Scaffolding involves various instructional techniques, including modelling, questioning, and providing hints or partial answers, which enable students to gradually achieve independence in their learning process (Shareef 2025). In the context of

postgraduate supervision, these concepts illustrate the potential for transforming supervisory practices by fostering deeper engagement and enhancing student competency.

In postgraduate education, the application of ZPD and scaffolding principles can have significant implications for the supervisory relationship between faculty/Department and students. Adequate supervision requires an understanding of each student's individual capabilities and the challenges they face. For instance, methodologies designed to assess students' current proficiency levels can guide supervisors in providing tailored support that promotes independent problem-solving. Such an approach is essential, given that postgraduate students often undertake complex research tasks that require high levels of critical thinking and analytical skills. Leveraging scaffolding techniques aligned with ZPD principles, supervisors can help students bridge the gap between their existing skills and the competencies required to complete their degrees.

Moreover, the interplay of scaffolding and ZPD promotes a collaborative learning environment, fostering greater student engagement and motivation. Research has shown that when supervisors adopt a supportive and interactive approach, students are more likely to develop a sense of self-efficacy and commitment to their work (Akala 2023). This relates closely to Self-Determination Theory (SDT), which emphasises the importance of autonomy and competence in motivating learners. By using scaffolding techniques grounded in ZPD, supervisors can empower their students to take ownership of their research, increasing their intrinsic motivation and likelihood of successful outcomes. For instance, creating opportunities for students to choose their research topics and approaches enhances their autonomy and aligns their educational experiences with their personal interests and goals.

The principles of the ZPD and scaffolding within postgraduate supervision can facilitate a more effective learning environment that actively supports students' growth. Recognising the individual needs and capabilities of students, supervisors can provide tailored guidance, enabling learners to progress towards greater independence and confidence in their academic pursuits. Adopting these strategies can significantly enhance the educational

experience for postgraduate students, ultimately improving graduate outcomes and contributing to the development of skilled researchers who can navigate complex challenges in their fields. The thoughtful application of ZPD and scaffolding principles thus offers a pathway to foster not just academic achievement, but also a vibrant academic culture that prioritises student engagement and success.

4. From Scaffolding to Autonomy: An Integrated Theoretical Perspective

Postgraduate supervision is increasingly conceptualised as a developmental process rather than a static or uniform practice. This study advances an integrated theoretical perspective that combines Vygotsky’s ZPD and SDT to explain how adequate supervision can intentionally progress from structured scaffolding to autonomous scholarly engagement. Together, these theories provide complementary insights into *how* supervisors support postgraduate students’ learning and *why* such support enhances motivation, productivity, and timely graduation. The integration of ZPD and SDT can offer a coherent framework for understanding supervision as a dynamic interaction between developmental support and motivational fulfilment.

The ZPD conceptualises learning as occurring within a space where students can perform complex tasks with guidance that they cannot yet accomplish independently (Vygotsky 1978). In postgraduate supervision, this translates into scaffolding practices such as modelling research processes, providing structured feedback, clarifying expectations, and guiding methodological and theoretical decision-making in line with researchers (Rathilall 2025). Contemporary scholarship emphasises that effective scaffolding is adaptive and responsive, requiring supervisors to continuously assess students’ evolving research competence and adjust their level of support accordingly (Shabani, Khatib and Ebadi 2019; Krebler 2023). When scaffolding is appropriately calibrated, it enables postgraduate students to progressively internalise research skills, critical thinking, and academic norms, thereby moving closer to independent scholarly practice.

However, scaffolding alone is insufficient if it does not transition deliberately toward autonomy. Overly directive or prolonged supervisory control can foster dependency, limit critical engagement, and undermine students' confidence as independent researchers (Van der 2025). This is where SDT provides essential explanatory depth. SDT posits that optimal motivation and sustained performance depend on the satisfaction of three basic psychological needs: autonomy, competence, and relatedness (Ryan and Deci 2020). In the context of postgraduate supervision, autonomy refers to students' sense of ownership and control over their research; competence reflects their confidence in their research abilities; and relatedness denotes the quality of the supervisor–student relationship. Supervision that supports these needs enhances intrinsic motivation, persistence, and research engagement (Jeno, Danielsen and Raaheim 2018).

Combining Self-Determination Theory (SDT) with the Zone of Proximal Development (ZPD) redefines scaffolding. It becomes a temporary strategy to support independence rather than control. Scaffolding builds skills within the ZPD, and SDT shows that more independence increases motivation and self-regulation. As students gain competence through guided practice, supervisors intentionally reduce directive input, encourage independent decision-making, and reposition themselves as critical peers rather than instructional authorities. This transition is essential for postgraduate productivity, as autonomous students are more likely to demonstrate initiative, sustained research engagement, and timely progression toward completion (Ofem et al. 2025).

Within the South African higher education context, this integrated perspective is particularly salient. Postgraduate students often enter programmes with uneven academic preparation and varying exposure to research cultures, necessitating early-stage scaffolding (Bao 2025). At the same time, national imperatives to improve postgraduate throughput and research outputs require supervision practices that cultivate independence rather than prolonged dependency (CHE 2022). Combining ZPD and SDT, this study conceptualises postgraduate supervision as a developmental continuum that begins with structured scaffolding and culminates in the formation of an autonomous scholarly identity. This integrated theoretical

perspective provides a robust foundation for supervision practices that enhance postgraduate productivity, reduce time-to-degree, and improve graduation outcomes in South African universities.

Rooted in Vygotsky's work, the ZPD is defined as the range of tasks that a learner can complete with guidance but cannot yet perform independently. This concept underscores the importance of social interaction in the learning process, particularly in academic settings where novice students often require significant support to navigate complex tasks, such as conducting research or writing dissertations. Scaffolding, closely associated with the ZPD, refers to the educational support provided by more knowledgeable peers, supervisors, or other lecturers to help students achieve higher levels of understanding and skill (Redburn and Hayes 2024; Van Nooijen et al. 2024).

In the context of postgraduate supervision, these concepts work together to provide a structure that promotes student autonomy. Autonomy, as described in SDT, is critical for fostering intrinsic motivation. When supervisors scaffold effectively, they do so to gradually withdraw assistance as students develop their competence. This dynamic is essential in allowing students to become autonomous researchers. As students gain confidence in their abilities, they can begin to undertake tasks independently, transitioning from guided practice to self-sufficiency in their academic pursuits (Guleç 2024 and Uzun 2024). The balance between providing support and encouraging independence is foundational to maximising students' learning potential and ensuring their academic success.

Effective scaffolding requires a nuanced understanding of individual student needs within their ZPDs. Supervisors must tailor their support strategies to reflect the unique strengths and weaknesses of each student. An effective supervisor employs formative assessment techniques to gauge where a student might be struggling and to adjust their scaffolding accordingly (Dwigustini et al. 2022; Schweiker and Levonis 2023). For example, a supervisor might initially provide extensive guidance on methodological approaches and gradually shift toward promoting critical thinking and decision-making as students become more competent. This tailored approach not only supports the development of specific skills but also fosters essential

qualities such as self-efficacy and resilience, which are crucial for navigating the challenges of postgraduate studies. Moreover, integrating ZPD and scaffolding into postgraduate supervision fosters a supportive academic community. When supervisors engage with students in a manner that emphasises collaboration and mutual support, it enhances the overall learning environment. Such an academic culture, where peer interactions are encouraged, can foster shared learning experiences that reinforce students' ability to operate autonomously. Over time, this leads not only to improved individual outcomes but also to a greater sense of belonging within the academic community, which further fosters motivation and engagement in their studies (Redburn and Hayes 2024; Rivas and Albertos 2023). In this vein, the progressive movement from scaffolding to autonomy is not merely an individual journey but a collective endeavour that enriches the institutional culture of learning.

Through understanding the critical role of support and guidance in student development, supervisors can effectively promote independence while fostering a collaborative learning environment. This approach ultimately cultivates not only competent researchers but also confident, motivated individuals prepared to make meaningful contributions to their fields of study.

5. Conceptual Framework for Enhancing Postgraduate Supervision

This study proposes a conceptual framework for enhancing postgraduate supervision that is grounded in the integrated application of SDT and Vygotsky's ZPD. The framework conceptualises postgraduate supervision as a developmental and motivational continuum in which supervisory practices evolve from structured scaffolding to autonomous scholarly engagement. The central premise of the framework is that postgraduate productivity and graduation outcomes are optimised when supervision simultaneously addresses students' developmental learning needs and their intrinsic motivational drivers.

At the core of the framework is supervisory scaffolding, derived from the ZPD, which represents the initial phase of postgraduate supervision. During this phase, supervisors provide targeted academic and research support aligned to students’ current level of competence. This includes clarifying research expectations, guiding problem formulation, modelling research methodologies, offering constructive feedback, and supporting academic writing and ethical research practices. According to ZPD, learning is most effective when support is pitched just beyond the learner’s current ability and adjusted as competence develops (Vygotsky 1978; Shabani, Khatib and Ebadi 2019). In postgraduate supervision, this adaptive scaffolding is critical for students who enter programmes with uneven academic preparation, a common characteristic of the South African higher education context (Kreber 2023).

Embedded within the scaffolding process are the motivational conditions articulated by SDT: autonomy, competence, and relatedness. The framework posits that scaffolding should not be controlling, but rather autonomy-supportive, enabling students to assume ownership of their research gradually. As supervisors provide guidance, they simultaneously foster competence by building students’ confidence in their research skills, promote relatedness through supportive and respectful supervisory relationships, and encourage autonomy by allowing independent decision-making (Ryan and Deci 2020). When these psychological needs are satisfied, postgraduate students are more likely to demonstrate sustained motivation, persistence, and engagement with their research tasks (Jeno, Danielsen and Raaheim, 2018).

As students’ research competence increases, the framework emphasises a deliberate reduction of scaffolding, marking the transition from guided learning to independent scholarship. Supervisors shift roles from directive instructors to critical peers and mentors, providing high-level intellectual engagement rather than procedural guidance. This transition is a defining feature of the framework, as prolonged or misaligned supervision can inhibit autonomy and create dependency, negatively affecting productivity and time-to-degree (Crofford et al 2025). In contrast, supervision that intentionally withdraws support at appropriate stages enhances self-regulation, critical thinking, and the formation of a scholarly identity.

The framework further links this developmental progression to key postgraduate outcomes, including increased research productivity, timely completion, and successful graduation. In the South African context, where national policy frameworks emphasise postgraduate throughput and research productivity, this conceptual model provides a theoretically grounded basis for improving supervisory practice and academic staff development initiatives (Council on Higher Education 2022; DHET 2020).

Moreover, the proposed conceptual framework positions effective postgraduate supervision as an intentional, theory-driven process that strikes a balance between support and independence. Integrating Self-Determination Theory and the Zone of Proximal Development, the framework offers higher education institutions a coherent lens for enhancing supervision practices that respond to student diversity, promote intrinsic motivation, and ultimately improve postgraduate productivity and graduation outcomes.

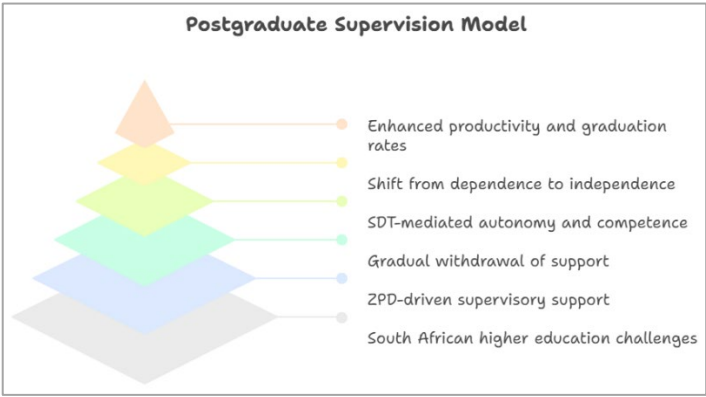


Figure: Conceptual Model of Postgraduate Supervision from Scaffolding to Autonomy

The Postgraduate Supervision Model illustrates a layered and developmental approach to postgraduate supervision, grounded in Vygotsky’s ZPD and SDT. The model is structured from the base to the apex, indicating a progressive movement from contextual constraints and intensive supervisory support towards student autonomy, productivity, and successful graduation. Each layer represents a critical stage in the supervision process, emphasising

that adequate postgraduate supervision is not static but evolves as students’ competence and independence grow.

The model is built on the challenges faced by higher education in South Africa, including resource constraints, significant supervisory burdens, and systemic demands to enhance student success rates. Built upon this foundation is ZPD-driven supervisory support, which reflects the initial phase of postgraduate supervision, in which structured guidance, modelling, and close academic support are essential. As students develop research competence, supervisors gradually withdraw support, carefully reducing directive intervention while encouraging independent thinking and problem-solving. As students cultivate their research competencies, supervisors gradually reduce their level of support, thereby fostering independent thinking and problem-solving skills. This approach is in line with the ZPD principle, which asserts that optimal learning occurs when support is tailored and systematically diminished as learners achieve mastery. Mental progression aligns with the ZPD principle that learning is optimised when support is responsive and progressively reduced as learners gain mastery.

The upper layers of the model are informed by SDT, which highlights the central role of autonomy and competence in sustaining motivation and academic engagement. As supervisory support is withdrawn, students transition from dependence to independence, assuming ownership of their research and developing a strong scholarly identity. The apex of the model represents the ultimate outcomes of adequate supervision: enhanced postgraduate productivity and improved graduation rates. Overall, the model demonstrates that when supervision strategically integrates developmental scaffolding with motivational support, postgraduate students are more likely to progress efficiently, complete their studies on time, and emerge as independent scholars capable of making meaningful contributions to the higher education and research landscape.

6. Implications for Postgraduate Supervision Practice in South African Universities

The conceptual model developed in this study has significant implications for postgraduate supervision practice in South African universities, particularly for enhancing research productivity, reducing time-to-degree, and improving graduation outcomes. First, the model emphasises the importance of supervisors adopting a developmental, differentiated approach to supervision rather than a one-size-fits-all approach. Given the diverse academic backgrounds and varying levels of research awareness among postgraduate students in South Africa, supervisors should intentionally align their level of support with students' evolving competencies. Early-stage postgraduate students may require intensive ZPD-driven scaffolding, including structured guidance, explicit expectations, and close feedback. In contrast, advanced-stage students benefit more from autonomy-supportive supervision that promotes independent decision-making and critical engagement.

Second, SDT highlights the importance of autonomy-supportive supervisory practices in sustaining postgraduate motivation and persistence. Supervisors should create environments that foster student ownership of research projects, encourage intellectual risk-taking, and recognise students as emerging scholars rather than passive recipients of instruction. Practical strategies include negotiated research plans, shared decision-making regarding methodological choices, and reflective supervision meetings focused on skill development and scholarly growth. Such practices strengthen students' sense of competence and relatedness, which are essential for sustained engagement, particularly in contexts where postgraduate students face financial, professional, and personal pressures alongside their studies.

In line with Maistry (2022), the model suggests that institutions should move beyond viewing supervision as an individual responsibility and instead support it as a professional pedagogical practice. This has implications for academic staff development, workload allocation, and policy formulation. Universities should invest in structured supervisor training programmes grounded in developmental and motivational theories, provide clear

institutional guidelines for progressive supervision, and recognise adequate supervision in performance and promotion criteria. By embedding theory-informed supervision practices within institutional cultures, South African universities can better support both supervisors and students, ultimately enhancing postgraduate productivity, improving graduation rates, and strengthening the overall quality of postgraduate education.

Implications for Policy and Academic Staff Development

The conceptual model presented in this study has significant implications for higher education policy and academic staff development in South African universities. At the policy level, the findings suggest a need to reconceptualise postgraduate supervision as a strategic and pedagogical function rather than an informal or purely individual academic responsibility. Institutional and national policies should explicitly articulate expectations for developmental supervision that progress from structured scaffolding to student autonomy. This includes embedding theory-informed supervision principles, particularly those derived from SDT and the ZPD, into postgraduate supervision guidelines, quality assurance frameworks, and performance indicators aligned with national throughput and research productivity targets.

Furthermore, the model emphasises the importance of institutional policies that foster an environment conducive to adequate supervision. This includes realistic workload models, recognition of supervision excellence in promotion and reward systems, and the provision of academic support structures such as writing centres, research methods support, and postgraduate peer communities. Through aligning policy frameworks with structured academic staff development initiatives, South African universities can strengthen supervisory capacity, enhance postgraduate productivity and graduation outcomes, and contribute more effectively to national goals of research development and human capital formation.

7. Contribution of the Study to Higher Education Scholarship

This study contributes to higher education scholarship by advancing a theoretically integrated understanding of postgraduate supervision that bridges developmental and motivational perspectives. By synthesising SDT and the ZPD, the study moves beyond fragmented or practice-based accounts of supervision to offer a coherent conceptual framework that explains how supervision can intentionally transition from scaffolding to autonomy. Like in the study of Machingura, Francis and Shamiso (2026), the study enriches the literature by positioning postgraduate supervision as a dynamic pedagogical process that simultaneously supports competence development and intrinsic motivation, particularly within the under-researched context of South African higher education. In doing so, it provides a theoretically grounded lens for analysing supervision practices, informs future empirical research on postgraduate productivity and graduation outcomes, and offers transferable insights for higher education systems facing similar challenges globally.

8. Conclusion

This conceptual study set out to advance a theoretically grounded understanding of postgraduate supervision by integrating SDT and Vygotsky's ZPD to explain how supervision can intentionally progress from structured scaffolding to autonomous scholarly engagement. The analysis has demonstrated that postgraduate supervision is not a static or uniform activity, but a developmental and motivational process that must evolve in response to students' growing research competence and independence. By framing supervision as a continuum, the study highlights the importance of aligning supervisory support with students' developmental needs while simultaneously nurturing autonomy, competence, and relatedness.

The study further underscores that many of the challenges affecting postgraduate productivity and graduation outcomes in South African universities, such as delayed completion, uneven research preparedness, and

student dependency, can be traced to supervision practices that lack theoretical coherence. By integrating SDT and ZPD, this study provides a coherent conceptual framework that explains how effective scaffolding, when applied in an autonomy-supportive manner, can enhance motivation, sustain engagement, and facilitate the transition to independent scholarship. This theoretical synthesis offers a meaningful contribution to postgraduate supervision scholarship by bridging developmental learning theory and motivational psychology within a higher education context.

In conclusion, the study argues that enhancing postgraduate productivity and graduation outcomes requires intentional, adaptive, and theory-driven supervision practices. The proposed conceptual framework provides higher education institutions, supervisors, and policymakers with a valuable lens for rethinking supervision as a pedagogical practice that balances support and independence. While the study is conceptual, it lays a strong foundation for future empirical research to test and refine the model across different institutional contexts. Ultimately, adopting supervision approaches that deliberately move from scaffolding to autonomy holds significant potential to strengthen postgraduate education and research capacity in South African universities and beyond.

Recommendation

Based on the theoretical insights of this study, it is recommended that South African universities adopt theory-informed postgraduate supervision frameworks that explicitly integrate principles of SDT and the ZPD into supervisory practice. Institutions should encourage supervisors to apply adaptive scaffolding strategies that are gradually withdrawn as students’ research competence develops, while simultaneously fostering autonomy, competence, and supportive supervisory relationships. This approach should be supported through targeted supervisor training, clear institutional guidelines on developmental supervision, and alignment of supervision practices with postgraduate throughput and graduation targets. Implementing such a structured yet flexible supervision model is likely to enhance postgraduate productivity, reduce time-to-degree, and improve overall graduation outcomes.

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