frontiers | Frontiers in Education

TYPE Review
PUBLISHED 14 August 2025
DOI 10.3389/feduc.2025.1634459

OPEN ACCESS

EDITED BY
Matthias Stadler,
LMU Munich University Hospital, Germany

REVIEWED BY
Peter Mkhize,
University of South Africa, South Africa
Venance Timothy,
Dar es Salaam University, Tanzania

*CORRESPONDENCE
Elisha Mupaikwa
✉ mupaikwae@gmail.com

RECEIVED 27 May 2025
ACCEPTED 28 July 2025
PUBLISHED 14 August 2025

CITATION
Mupaikwa E (2025) Toward an evaluation framework for Education 5.0 in institutions of higher learning in Zimbabwe.
Front. Educ. 10:1634459.
doi: 10.3389/feduc.2025.1634459

Toward an evaluation framework for Education 5.0 in institutions of higher learning in Zimbabwe

Elisha Mupaikwa*

Faculty of Communication and Information Science, Department of Library and Information Science, National University of Science and Technology, Bulawayo, Zimbabwe

Education 5.0 was introduced in 2019 to address Zimbabwe's National Development Agenda. However, to date, no study has evaluated Education 5.0, and no framework has been developed to perform this evaluation in Zimbabwe's institutions of higher learning. This study aims to develop a framework to evaluate Education 5.0 in Zimbabwe's institutions of higher learning. This study adopted the systematic literature review approach on journal articles from academic databases such as EmeraldInsight, Google Scholar, PubMed, ERIC and JSTOR. A total of 123 articles were downloaded from these 40 were considered for the review. The major findings of the study were that the success of Education 5.0 was influenced by the availability of digital infrastructure and associated digital literacies. The study further revealed that innovation competencies influenced innovative strategies implemented in institutions of higher learning and that each of the five major variables was measured by a set of attributes. Challenges that confronted educational institutions in implementing Education 5.0 included resistance to change, lack of funding, lack of physical and digital infrastructure, resistance by academic staff members and students and their negative perceptions toward Education 5.0.

KEYWORDS

Education 5.0, teaching, research, community service, innovation, industrialization

Introduction

Historically, the evolution of educational systems has been an ongoing process driven by several socio-economic and state-ideological beliefs and aspirations. Globally, the traditional teacher-centered Education 1.0 has given way to the technology-driven and student-directed models of education, such as Education 5.0. To rectify the social, political, and economic disparities that existed before Zimbabwe's independence from colonial authority in 1980, the government has periodically implemented several educational reforms that also sought the overall advancement of Zimbabwean communities. Thus, it can be argued that in Zimbabwe, the official ideology has always played a major role in curriculum and educational reforms at all educational levels, including universities. Curriculum reforms in higher education have always been influenced by the government, through the relevant ministry that is in charge of higher education in Zimbabwe. Despite several reforms having been carried out in the broader educational environment in Zimbabwe, those writers who have evaluated the various educational models have highlighted several challenges. For example, according to Majoni (2014) and Mpofu et al. (2024), for a number of years now, the higher education sector globally has witnessed declining student enrolment, a rise in operational costs, as well as technological changes and changing educational demands. Majoni (2014) further reported that universities were facing challenges in research and publication, quality assurance, loss of qualified and

experienced staff, high student dropouts, and lack of funding. Majoni (2014) further reported that many employers held the view that graduates from colleges and universities were too theoretical, had the wrong attitudes and were unwilling to learn. As such, students faced the problem of unemployment since employers feel universities are offering courses that are not in line with their requirements, and graduates are ill-equipped for the jobs available. Mahere (2025) also reported that higher education institutions had to make the most of limited resources to meet teaching and learning needs. This created push factors that accelerated brain drain, wherein highly qualified, experienced, and competent higher education professionals left the country for greener pastures. However, the brain drain led to a push for internationalized university curricula with the potential to better prepare students for international employability. These trends have compelled leaders within the higher education sector to restructure the university business models around the four main and consistent goals of: improving the students' learning environment, increasing operational efficiency, increasing cutting-edge research and stimulating innovation in education (Alenezi, 2021). A key measure of a university's success and competitiveness, locally and globally, is its ability to internationalize. Majoni (2014) further recommended that universities need rapid adaptations and redesigning of courses to match the rapidly changing environments and the demands of a diverse world. To address the changing needs of the nation, the government of Zimbabwe then developed the National Development Strategy (NDS), aligned to the Sustainable Development Goals (SDGs). For institutions of higher learning in Zimbabwe, the NDS mandated these institutions to play a significant role in the cross-sectoral implementation of the SDGs by contributing research knowledge, innovation and the development of business startups, and exerting influence over policy and decision-making. These practices were integrated into what was called Education 5.0. Zimbabwe implemented Education 5.0 because it was necessary to align higher education curricula with the country's Vision 2030 and NDS, both of which were motivated by the need to meet the SDGs set forth by the United Nations. This led to significant changes in research focus, the innovation drive and investments in higher education systems, to now produce a variety of creative solutions to national issues. To meet the urgent national goal of becoming middle-income by 2030, Zimbabwe's state universities redesigned their traditional tripartite mission of teaching, research, and community service, but these reforms were also driven by the need to standardize learning. This resulted in the 2017 proposals for minimum bodies of knowledge, the introduction of the credit system of learning for disciplines of higher education and the 2017 pronouncement of Education 5.0 by Professor Amon Murwira, Minister of Higher and Tertiary Education. This change of an educational model from Education 3.0, which comprised teaching, research, and community service as its components, was followed by Education 5.0, which aimed to promote the adoption of heritage-based education. Teaching, research, community service, innovation, and industrialization were the main components of Education 5.0. Jonathan (2019) claims that this model is an outcome-focused approach to teaching problem-solving and value-creation that would help Zimbabwe become more industrialized, contemporary, and competitive. The doctrine of Education 5.0, according to Jonathan (2019), would sufficiently equip Zimbabwe to meet the demands of the fourth industrial revolution, such that higher education institutions would generate graduates who are not job seekers but rather possess entrepreneurial abilities and are prepared to establish industries. In the Education 5.0 model of learning, universities increase their influence on society by educating students and strengthening their critical thinking abilities (Bhatia, 2018), facilitating their evolution from being only focused on research and instruction to becoming knowledge centers that foster innovation. To go beyond tradition by fostering students to become champions of new and innovative sustainable practices that improve the wellbeing of society, institutions of highereducation were compelled to embrace technology and innovation in response to mounting pressure to attract students who conduct impactful research (Tornatzky and Fleischer, 1990; Youtie and Shapira, 2008; Filho et al., 2018; Bhatia, 2018; Purcell et al., 2019). To that end, therefore, the government of Zimbabwe launched several initiatives to enable higher education institutions to be creative in spearheading the nation's industrialization efforts to facilitate the implementation of Education 5.0. One such initiative was the creation of innovation hubs within higher education institutions. According to Youtie and Shapira (2008); Djeflat (2015), and Bhatia (2018), innovation hubs are research centers that offer knowledge and skills in technology and innovation management. They also encourage the generation of new ideas to help the economy and society deal with the issues of a growing population. These hubs make it possible for communities, students, and researchers to connect and share knowledge (Youtie and Shapira, 2008). In Education 5.0, universities are expected to create industrial parks and innovation hubs as part of the process of industrialization and innovation. The purpose of industrial parks is to encourage the establishment of industries within universities. As a result, industrial parks house offices and operational businesses, including soap factories, bakeries, and lumber mills (Kwandayi, 2021). Several breakthroughs have since come from the University of Zimbabwe, the Harare Institute of Technology, and the National University of Science and Technology's innovation hubs. The Tap Card systems created by the Harare Institute of Technology and the NMB Bank are one example of an idea that has been commercialized.

From the time Education 5.0 was pronounced, however, concerns have been voiced over the quality of education in institutions of higher education despite the government's efforts to change higher education in Zimbabwe. Despite these concerns, none of the few published studies on Education 5.0 in Zimbabwe have evaluated the program. Instead, they have only examined its implementation. Among these few are Togo and Gandidzanwa (2021), who examined the role of Education 5.0 in the country's achievement of SDGs and the difficulties the University of Zimbabwe encountered in implementing Education 5.0. According to the study's findings, the University of Zimbabwe's biggest problems were a lack of financing for multidisciplinary research and supporting programs. Additionally, Mabhanda and Mabwe (2023) looked into the opportunities and difficulties Zimbabwe's tertiary institutions had when implementing Education 5.0. Another study by Mabika and Maireva (2023) found that teaching staff struggled to use digital tools to promote blended learning in

Education 5.0, which hindered their attempts to meet the aims and outcomes of Education 5.0.

Statement of the problem

The necessity to satisfy societal and national economic needs, which are frequently ingrained in these countries' industrial advances, has propelled educational changes on a global scale. Since gaining independence in 1980, Zimbabwe has implemented several reforms in the education system at all levels of education to resolve colonial imbalances that existed before independence, as well as the need to meet industrial demands for skilled labor and economic growth. Following these changes, Education 5.0 was introduced in 2018, aiming to use heritage-based innovation and industrialization to address the country's economic and industrialization issues. Since the government has invested in innovation hubs designed to drive industrialization and innovation, the necessity to adopt Education 5.0 has become more apparent in Zimbabwe's higher education institutions, including universities and polytechnic institutes. There has been no evaluation of Education 5.0, even though the Zimbabwean government has allocated financial and technical resources to its creation. The study's objective is to assess Education 5.0 at a few Zimbabwean higher education establishments.

Research questions

i) What variables may be used to evaluate teaching in Education 5.0 in Zimbabwe's institutions of higher education?
ii) Which criteria may be used to assess the impact of research carried out in higher educational institutions in Zimbabwe?
iii) What factors are used to assess higher educational institutions' roles in community service under Education 5.0 in Zimbabwe?
iv) How best can innovation activities under Education 5.0 in higher education institutions be assessed?
v) What factors are considered when evaluating Zimbabwean higher education institutions' roles in industrialization?

Methods

The study approach takes advantage of a research technique called a Systematic Literature Review (SLR) is used to gather, examine, and synthesize pertinent literature on a certain topic of study. To reduce research bias and guarantee that all pertinent material has been reviewed, this strategy includes methodical procedures. This method is especially helpful for assessing Education 5.0 in the context of Zimbabwe. The process of gathering data is accomplished by locating and assessing pertinent scientific publications. A literature search was conducted in four phases following the PRISMA methodology. During identification, a scoping literature review was conducted to develop an understanding of the current state of the literature and test a range of keywords. A combination of two keywords, "Evaluation' AND ('Education 5.0')," "Evaluating teaching' AND ('Education 5.0')," "Evaluating research' AND ('Education 5.0')," "Evaluating research' AND ('Education 5.0')," "Evaluating community service' AND ('Education 5.0')," "Evaluating innovation' AND ('Education 5.0')," and "Evaluating industrialization' AND ('Education 5.0')" were used to conduct a literature search in four databases, PubMed, ERIC, Google Scholar, Emerald Insight and JSTOR. The search terms were derived from the variables of the objectives. A total of 125 records were identified, and their distribution is shown in Table 1 below.

TABLE 1 Distribution of articles.

Database	Articles
PubMed	24
ERIC	11
Google scholar	74
Emerald insight	10
JSTOR	6
Total	125

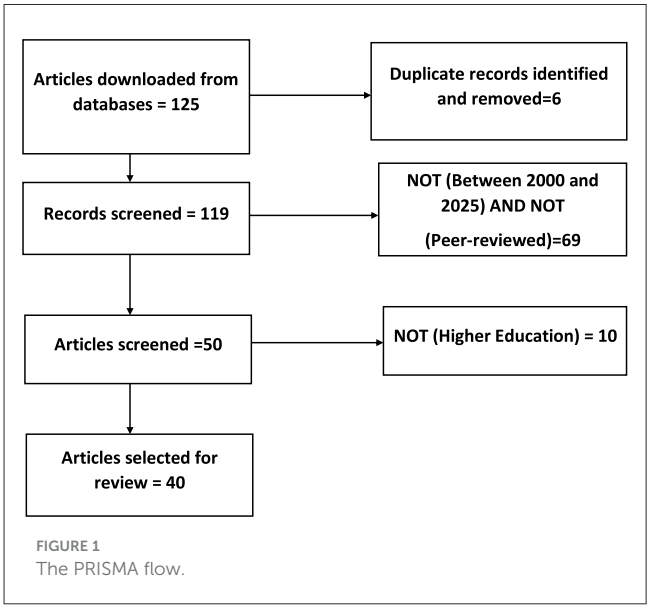

FIGURE 1
The PRISMA flow.

Having identified the 125 potentially useful articles, the author identified 6 duplicate records and retained 119 articles, as shown in the PRISMA flow diagram in Figure 1 below. The inclusion criteria for the search were peer-reviewed journal articles published between 2000 and 2025 and having gone through a peer-review process. This stage excluded 69 articles, leaving 50. From the 50 articles that remained, the authors excluded 10 articles that did not examine higher educational institutions.

The process retained 40 articles, which were then considered for the final analysis. Following the identification of pertinent publications, each chosen article was carefully read before the data analysis process started. Relevant information on factors to take into account when assessing the five main components of Education 5.0 was found. After that, this data is examined to determine trends, patterns, and consistency in the results. Additionally, the study makes it possible to identify important

variables to evaluate while assessing Education 5.0. The findings of this analysis serve as the foundation for the conclusions in the SLR report, which provides a thorough overview of the factors to take into account when assessing Education 5.0. This method is frequently employed as a foundation for developing theories, new hypotheses, or independent studies to go deeply into a subject.

Results and discussions

Evaluation of teaching

From the literature, several approaches have been used to evaluate teaching in educational environments. For example, Boyle and Cook (2023) says that evaluation takes place in four different areas of social practice: systemic/sector-wide (Accountability, Management, Comparison, and Auditing); programmatic/government-initiated program (Impact, Effects, and Value for money); institutional/university-wide (Quality assurance, Quality standards, Enhancement); and self/Course, subject, unit, or module (Value, Impact, Enhancement). However, the emphasis in each of these exercises is on the learners' levels of knowledge (cognitive), attitude (behavioral), and capabilities. From a behaviorist perspective, learning is defined as the modification of a behavioral tendency by experience and as knowledge or skill acquired by instruction (Merriam-Webster, 2018). In the classroom environment, Simonson et al. (2022) argue that the majority of institutional methods for assessing instruction are insufficient, imprecise, and do not immediately enhance instruction or provide incentives for it. This is frequently because evaluating effective instruction is challenging, and the majority of tools fail to do so sufficiently or effectively and frequently lack defined standards (Simonson et al., 2022).

The traditional methods of evaluating teaching are student course evaluations. Generally speaking, student course evaluations are heavily overused, and in many situations, they serve as the only source of data used to assess instruction (Miller and Seldin, 2014). Although recent research indicates that the use of student course evaluations, also known as "student satisfaction surveys," is questionable, they can give students a voice in the evaluation process and allow them to perceive how their teachers affect them (McCabe and Layne, 2012; Flaherty, 2015; Richmond et al., 2014; Esarey and Valdes, 2020). Class observations have also been used for course evaluations. Although observations in the classroom might shed light on instructional strategies, using this information just for assessment or evaluation has disadvantages. First, large-scale classroom observations take a lot of time and effort and require a lot of resources (Durham et al., 2018; Teoh et al., 2016). Second, the type and caliber of information derived from the observations are significantly impacted by the person making them (Durham et al., 2018; Teoh et al., 2016). Furthermore, working in a system that necessitates reaching a consensus on nearly all choices, particularly those about job performance and job security, makes evaluating teachers even more difficult (Gray, 2016). In higher education, the tenure and promotion procedures and policies also have a direct impact on job security and performance. As such, these rules frequently place a higher priority on research than instruction, which results in inadequate teaching since faculty members devote most of their time to research projects and disregard teaching-related duties (Miller and Seldin, 2014). Simonson et al. (2022) proposed that the four main areas of an assessment that should be considered when deciding which aspects of teaching and learning to assess are: Course design, Scholarly teaching, Learner-centered teaching and reflective teaching techniques to promote ongoing teaching improvement. Besides this, Lu and Wu (2018) created an assessment model of teaching and learning using various methodologies. It consists of three primary conceptual components: instruction, learning, and learning support. Earlier on, Chalmers and Gardiner (2015) had also reported that the following were the most pertinent elements of teaching: (a) the variety of teaching preparation program types and goals; (b) the efficacy of these programs; (c) the influence of programs on teaching and learning; (d) the influence of institutional culture; (e) methods of measurement; and (f) impact indicators.

Research performance and impact

Contributing to the creation of new knowledge and innovations to improve practice is the main motivation for research in any higher education institution. As such, success in these areas determines research impact and performance, which are the two main dimensions of assessing research. The product of research, impact as a result of the community's ongoing output, quality as a benefit of research results, and utility, or the potential exploitation of the research, are the four main components of research performance, according to Hermanu et al. (2023a). Alomary (2020) notes that some academics cluster research performance indicators into two, that is, quantitative and qualitative indicators, further subdividing them into four categories: input, output, outcome, and process. Quantitative indicators include inputs and outputs, whereas qualitative indicators include processes and results. The evaluation of research performance, then, takes into account several input and output variables. Furthermore, Çakir et al. (2015) say that research performance can be explained by output indicators (research outputs), procedures (academic governance), curriculum evaluation at the institution, inputs (research money), and institutional nature (capacity and capability unique to the institution). Therefore, research effectiveness is determined by actions that provide wider outputs, outcomes, and impacts. Accordingly, the data on inputs, research procedures and outputs, outcomes, and impacts are all used to assess if a certain research project is meeting a specific need, reaching a specific beneficiary, or accomplishing a specific goal (Hinrichs-Krapels and Grant, 2016).

Research impact is a reporting service in the scholarly impact domain that generates impact reports for individual academics, schools, and faculties for a range of reasons using different bibliometric methods to demonstrate scholarly impact. Author-level, article-level, journal-level, and institution-level metrics are a few of these bibliometrics. One metric used to evaluate the influence of research at the journal level is the impact factor. Kolle (2022) states that the average number of citations received by papers published in a specific publication over a specified period is the impact factor. It is computed to evaluate the journal's performance. Here, the two most important factors are the number

of papers published in the journal and the number of citations to those articles in a certain year. The h-index is the widely used author-level statistic. The author's quality and productivity are the focus of the h-index. The author must publish additional works to increase their h-index, and the papers must receive citations at the same time. Metrics at the article level make it easier to understand how a given article affects other scholars and how it advances the field of study. The number of times a specific article is mentioned and cited in a peer-reviewed publication, typically in journals that are indexed by Web of Science and Scopus, can be used to measure the article's influence (Kolle, 2022). Iorwerth (2005) also suggested an alternative set of standards for assessing university research, which included the following standards: Appropriateness (*Was it the proper course of action?),* Economic (*Has it turned out to be less expensive than anticipated*?), Effectiveness (*Has it performed as expected?*), Efficiency (*How much does the investment yield?*), Efficacy (*How does the Return on investment stack up against projections?*), Process (*Is it functioning properly?*), Quality (*What is the level of output quality?*), Impact (*How has it affected things?*), Additionality (*What has transpired beyond what would have occurred in any case?*), Displacement (*What would have occurred in its absence but hasn't?),* Process Improvement (*What are some ways to improve it?*) and Strategy (*What ought to happen next?*).

Community services

College students, business players, and communities aim to use and maximize the potential of natural and human resources, as well as local culture, to improve their products through lectures and community service projects. They want their products to become instantly identifiable, accessible, and fiercely competitive. With the help of university professors, the potential of exceptional items found in different places might be further explored. Furthermore, by enlisting instructors from other universities who possess the necessary skills, collaboration between universities in community service could be promoted. Aligning research with community needs is one aspect of the mutually reinforcing process that involves institutions. By encouraging social welfare, creativity, entrepreneurial skills, and human resource development, universities impart knowledge to the community (Di Berardino and Corsi, 2018). As a proactive measure to enhance knowledge transfer and respond to community requirements, community service is incorporated into teaching and research at many institutions (Hermanu et al., 2022a,b). According to Jadhav and Suhalka (2016), community service in higher education is a commitment to social development and a win-win collaboration between academic institutions, businesses, and the government (Kruss et al., 2012). By encouraging innovation, social welfare, entrepreneurial skills, and human resource development, universities impart knowledge to the community (Di Berardino and Corsi, 2018; Mora et al., 2015). In this situation, action research is required to support an investigative process of community-based development to create self-sufficient individuals. But as concerns about universities' social roles have grown (Leten et al., 2014; Musselin, 2013), some of them have been trying to better explain how they affect their communities and society at large (Lendel, 2015; Marcovitch, 2019; Martin, 2012). According to Johansen and Arano (2016), universities benefit the areas in which they are located by giving local youth educational options and jobs for professionals in the area. By supporting local development, encouraging culture, and improving the region's reputation, university research programs can also improve community services (Leten et al., 2014). Filho and Junior (2020), based on bibliographical research, distinguished three categories of impacts: socioeconomic, scientific and technological, and on the region's culture and image. These three types of impact have been integrated into a conceptual model that can be used as a basis for a practical model to be employed to assess the impact of a university on the region in which it is located, and this conceptual model is shown in Figure 2 below.

Innovation

Lobo and Samaranayake (2020) define innovation as a new technology, service, or procedure that aims to enhance the performance of both individuals and organizations. One of the most important aspects of innovation, according to Smith (2003), is "ideation." Ideation lends legitimacy to best-practice research, which is based on both ideation and data-driven implementation. Kostoff (2005) believes that innovation reflects the metamorphosis from present practice to some new, hopefully, better practice. As action researchers, teachers can thus find new teaching, curriculum, and management techniques that will work well for their classes and can be shared with other educators. Goldsmith and Foxall (2003) have also imposed the notion of newness on the definition of innovation, proposing three distinct attributes of newness: resemblance, originality, and recency. Some studies have examined innovation from the standpoint of new product creation. New product development and commercialization have resulted from innovation and incubation at numerous businesses. In their research of a case study of the incubator associated with the Swedish medical university Karolinska Institute, Baraldi and Havenvid (2016) relied on seven essential elements of incubation: time, place, sources, resources, control/governance, activities/services, and outcomes. In the instance of the Karolinska Institute incubator, they found six distinct strategic drivers of business incubation: globalization, cooperation/competition, revenue model, risk-taking/time perspective, governance/control, and location in the value chain. Science parks, incubators, and accelerators (technology-based incubator mechanisms that offer vital value-added inputs necessary for the establishment and growth of innovative technology-based firms) are examples of frequently utilized incubation programs. According to Nandal et al. (2020), five different kinds of inventions emerge from innovations. These include:

a) Products and services that are "new to the world" and open up completely new markets;
b) New products that enable growth into new client segments;
c) New products for current clients;
d) Small adjustments to current clients, and
e) Cost savings for current products.

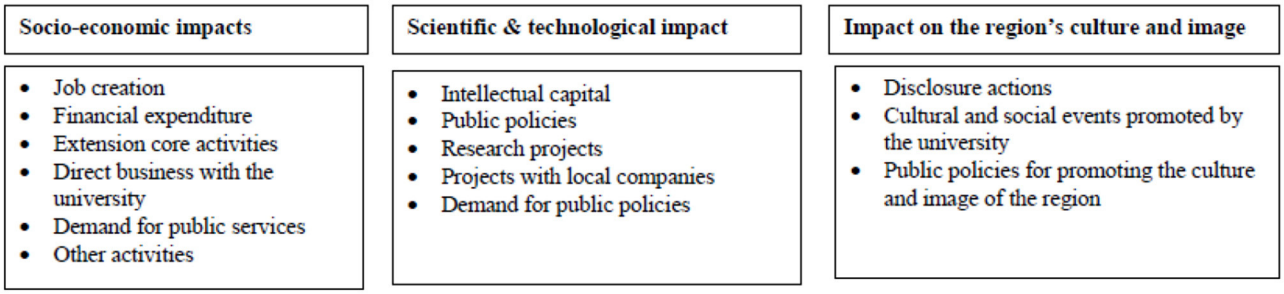

FIGURE 2
Conceptual model for assessing impact (Filho and Junior, 2020).

Ferreras-Garcia et al. (2021) and Nandal et al. (2020) divided innovation competencies into three categories: network, interpersonal, and individual competencies. The ability to relate to others in a goal-oriented manner that facilitates teamwork is sometimes referred to as interpersonal competence. This has a lot to do with the person's ability to network and build professional ties. The following Figure 3 below displays this framework:

The following metrics are used to quantify individual competencies: goal orientation, system thinking, and creative problem-solving. Additionally, Ferreras-Garcia et al. (2021) developed interpersonal dimensions of innovations, which include oral and written communication, teamwork, and leadership. The network dimension concentrates on a person's ability to collaborate in a multicultural, multinational, and multidisciplinary setting as well as their ability to work within networks. Ferreras-Garcia et al. (2021) list the following individual dimensions: initiative, creativity, risk-taking, persistence, personal attitudes, idea creation, change management, results orientation, decision-making, problem-solving, and critical thinking. Based on research, a set of metrics—divided into three categories: input, process, and output metrics—has been constructed from these aspects to create a framework for evaluating innovation. Financial resources are typically used to measure input metrics. Time management, innovation pipeline management, new project performance forecasts, and personnel concerning the plan are all included in process metrics. Metrics, including the number of new ideas created, the number of projects in the pipeline, the number of concepts that receive funding, the total estimated net present value of the projects in the pipeline, and the scope of the idea generation process, are also part of managing and monitoring the innovation pipeline. The following metrics make up the scope of the idea-generated process itself: the number of projects that achieve the predetermined goals, the accuracy of the new product forecast, and projected vs. actual performance. Nandal et al. (2020) output metrics are: New product revenue as a percentage, New product profit as a percentage, and New product revenue increase as a percentage. Some non-financial metrics may also be used to measure innovation, and these include patents generated and the number of new products launched. For institutions of higher learning, their innovative contributions to the economic development of nations have attracted the attention of some researchers, such as Jonkers et al. (2018), who then proposed an aggregation model showing outputs and their impacts on the economic development of nations as shown in Figure 4 below.

Industrialization

Globally, institutions of higher learning have been crucial to a country's industrial development. For instance, according to Bonvillian (2022), American higher education institutions have actively participated in industry research and development (R&D) to support production technologies in industries through technology development, with a particular focus on artificial intelligence, advanced materials, and information technology (IT). This has allowed them to participate in the Fourth Industrial Revolution (4IR). Among these is Carnegie Mellon University, which has actively participated in robotics applications research with a group of businesses called Advanced Robotics for Manufacturing (ARM). According to Kwandayi (2021), the major elements of industrialization in which universities must play a role across nations are:

a) Industrialization entails using machines to produce commodities.
b) In an industrialized nation, manufacturing employs the majority of the workers.
c) Universities should research to determine how to expand markets for emerging sectors, as industrialized nations have big markets.
d) Higher education research and innovation centers ought to lead accelerated innovation initiatives since industrialization is linked to faster high-tech innovations.
e) The national transportation network is developing in tandem with industrialization; university departments, including geography departments, should conduct research to advise the government on how to modernize the nation's transportation system.
f) One of the main characteristics of industrialization is the growing accumulation of capital for investment; university

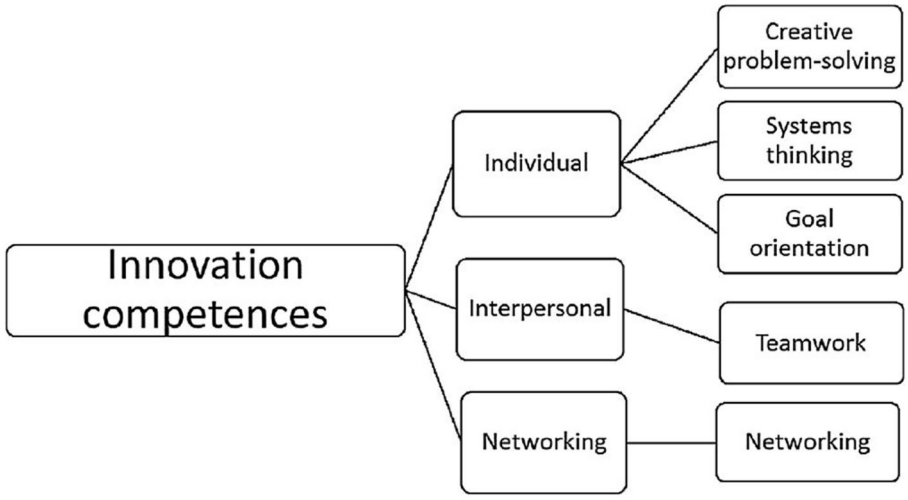

FIGURE 3
Innovation competencies (Nandal et al., 2020).

economics departments ought to advise the government on ways to boost investment.

g) Urbanization and the progressive growth of major cities and conurbations are typically positively correlated with industrialization. Departments of Rural and Urban Planning could help construct the nation's modern 21st-century cities.

For this to be achieved, however, Kwandayi (2021) made the following recommendations:

a) Universities ought to include the agenda for innovation and industrialization in their strategic plans, and each faculty should have a well-defined strategy outlining how it will carry out this agenda.

b) To plan the execution of research, innovation, and industrialization, each university should set up an inter-faculty coordinating team.

c) Universities must offer relevant and high-quality higher education if innovation and industrialization are to flourish. As a result, universities must constantly evaluate the caliber and applicability of their curricula.

d) Zimbabwean universities ought to reconsider whether the material covered in their research techniques courses is sufficient.

e) As emphasized by the MHTESTD in its 2019–2023 strategic plan, universities need to improve meaningful academia–public.

f) All disciplines must be fully involved in innovation and industrialization, even though STEM (science, technology, engineering, and mathematics) topics are essential to industrialization. Most crucially, as modernization involves a paradigm shift away from traditionalism and goes beyond industrialization, the humanities and social sciences must be instrumental in creating a cultural environment that is supportive of modernization. In the quaternary sector, social sciences are also essential for research and development.

e) Since industrialization necessitates inter-sectoral connections and teamwork, universities and other educational institutions, including schools, must collaborate with government agencies to advance the new educational push for industrialization.

Proposed Education 5.0 evaluation framework

The research community has produced several frameworks for assessing educational programs, but it is frequently unclear who these frameworks are meant for and why. Teaching, research, community services, innovation, and industrialization are the five components of Education 5.0 that the researcher proposes to be independently evaluated in the Zimbabwean setting. Therefore, the suggested framework takes into account the important components that come out of studies on the assessment of teaching and learning, as well as evaluations of the quality of instruction. To assess teaching and learning in Education 5.0, this review utilized factors from Chalmers and Gardiner (2015) and Simonson et al. (2022). While Filho and Junior (2020) offered the primary characteristics for evaluating community services, Hermanu et al. (2023b) and Iorwerth (2005) also gave variables on research evaluation. Figures 2–4 provide some variables that measure the various dimensions of Education 5.0, and these are authors such as Ferreras-Garcia et al. (2021) and Baraldi and Havenvid (2016), and these are then shown in the comprehensive framework in Figure 5 below.

The researcher proposes a framework that may be applied to evaluate Education 5.0's variables: Teaching, Research, Community service, Innovation and Industrialization. In

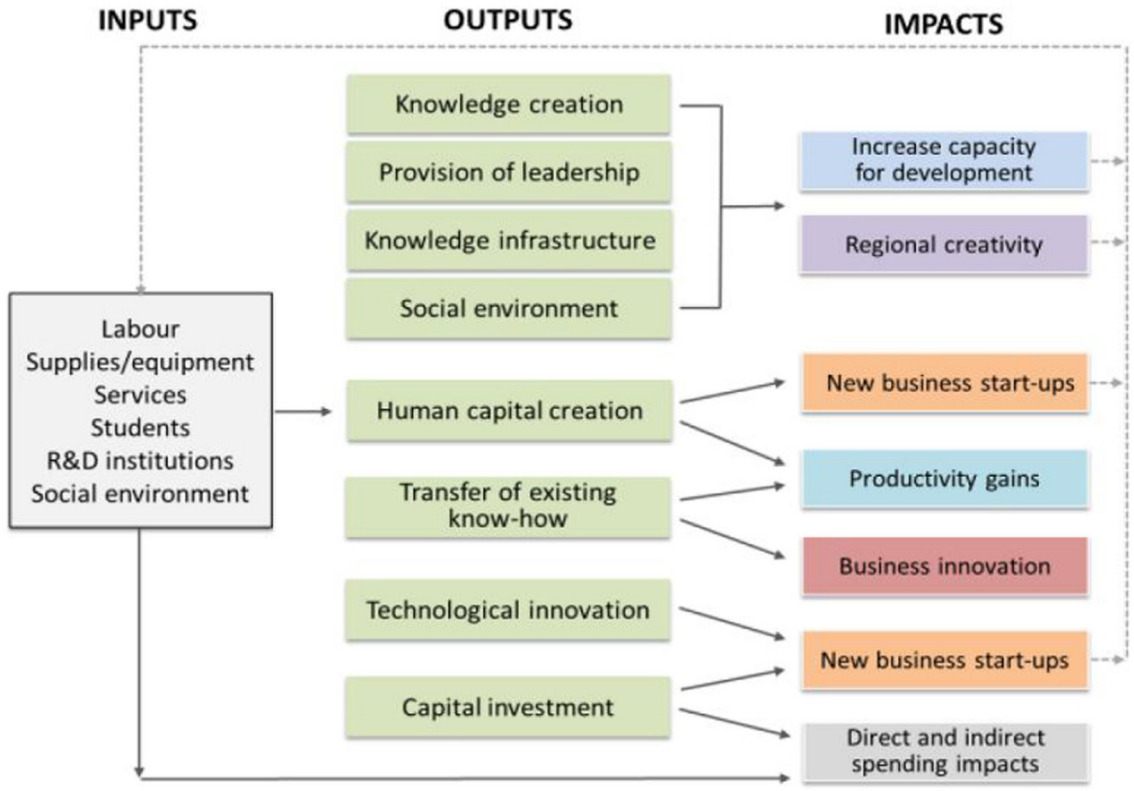

FIGURE 4
Innovation impacts: source (Jonkers et al., 2018).

Figure 4 below, the author argues that these variables are influenced by the status of digital infrastructure available in an institution, and the author proposes that the dominant technologies in Education 5.0 are artificial intelligence, the Internet of Things, Cloud computing, and blockchain technology. However, beneficial usage of these technologies is influenced by six types of digital literacy that have been reported before, and these are media literacy, computer literacy, information literacy, visual literacy, technological literacy and communication literacy.

In this framework, as shown in figure above, innovation is influenced by three innovation competencies, namely: individual competencies, interpersonal competencies and networking competencies (Nandal et al., 2020; Ferreras-Garcia et al., 2021). Additionally, assessment criteria for the major components of Education 5.0 are shown numbered 1–18 in Figure 5.

Conclusion

According to the literature review, there are several ways to define Education 5.0, and different institutions and countries have implemented it in different ways. This is because political and ideological considerations have frequently been the main forces behind curricular innovations and revisions, and these elements have differed from one country and institution to another. Nonetheless, these reviews show that digital technologies are essential to achieving the educational process's goals in the context of Education 5.0. Hence, the framework integrated into this model includes the various forms of digital literacies and which are: Media literacy, information literacy, Computer literacy, Visual literacy, Technological literacy and Communication literacy. These forms of illiteracy in Education 5.0 are key in facilitating life-long learning that would enable learners to significantly contribute to the development of their communities and nations through innovation, which may lead to industrial incubations. These different forms of illiteracies have also been acknowledged to significantly influence the major elements of Education 5.0, namely, Teaching, Research, Community Service, Innovation and Industrialization. The framework has also shown various variables that may be used to evaluate the five major elements of Education 5.0, specifically in the Zimbabwean context. Having recognized the fine major elements of Education 5.0, a review of literature has shown that teaching can be evaluated in terms of impact on the learner, the quality of learning, levels of knowledge, attitudes and skills. Thus, both cognitive and behavioral dimensions of learning are vital in evaluating education. Another emergent feature from the view is the importance of course evaluation by students, which enables students to

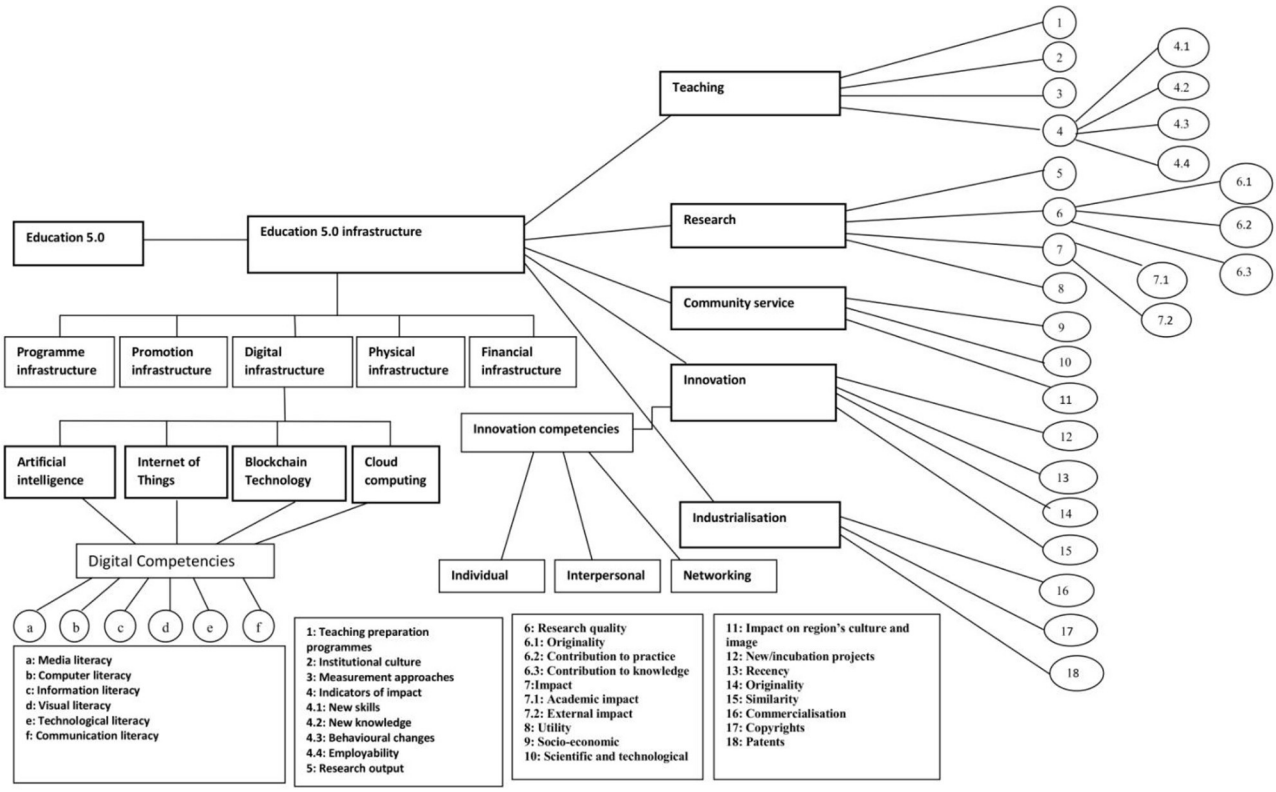

FIGURE 5
The proposed framework for evaluating Education 5.0.

have a say in the content and delivery of that content by their teachers. When evaluating research, there is a consensus in the literature that research is measured by research impact and research performance. These main dimensions are further measured by various variables identified in various contexts by researchers. However, these measures of research impact and research performance are generally categorized as quantitative or qualitative dimensions. When it comes to community service, there is a consensus among researchers that community service may be assessed by its socio-economic impact, scientific and technological impact, and the impact of the institution on the region's culture and image. Again, there are several variables that may be used to measure these dimensions, as shown in Figure 2. The review has also shown that innovation can be assessed through individual competencies, interpersonal competencies and networking competencies. The impact of innovations can then be evaluated on the capability of the innovation to improve productivity, improve the capacity for development, and the creation of startups and ideation, as shown in Figure 4. For industrialization, there is little literature that points the the roles institutions of higher learning may play in the industrialization of nations. However, those researchers who have evaluated higher education institutions' efforts in the industrialization of nations have agreed that the availability of innovation and industrialization strategies in institutions is one of the variables used to assess these institutions' roles in industrialization. Other variables that have been identified from literature are the existence of partnerships between industry and universities, research collaboration and the existence of partnerships through industrial hubs and industrial parks. In this proposed framework, the constructs used to evaluate teaching include teaching preparation or orientation programmes for teachers, institutional culture, measurement approaches to teaching and assessment, and the extent to which an educational exercise has created new knowledge and developed new skills and behavioral changes among learners. Research shall be evaluated using: research output, research quality(originality, contribution to practices and contribution to the creation of new knowledge) and research impact (academic impact, external impact and utility). Community services are evaluated by socio-economic factors, scientific and technological variables and the impact of the institution's activities on the culture and image of the region. Among the variables that may be used to evaluate the institution's contribution to the industrialization efforts of the nation are the number of patents and copyrights, and the number of projects that have been commercialized. Innovation is evaluated by new incubation projects developed, whether these are novel or recent projects. This study has been contextualized because, from the literature, various institutions and researchers have described Education 5.0 differently.

Author contributions

EM: Writing – review & editing, Writing – original draft.

Funding

The author(s) declare that no financial support was received for the research and/or publication of this article.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that no Gen AI was used in the creation of this manuscript.

Publisher's note

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