# Faculty Practices and Digital Integration of 21st-Century Skills: A Comparative Study of Saudi Arabia and South Africa

**Asma Abdulrahman Nami Alshaikh\***
*Department of Curricula and Teaching Methods, College of Education in Al-Kharj, Prince Sattam bin Abdulaziz University Al-Kharj, Saudi Arabia,*
*a.alshaikh@psau.edu.sa*

## Abstract

*This study presents a comparative investigation into faculty teaching practices, information literacy, indigenous knowledge, and the application of digital tools in the integration of 21st-century skills at Prince Sattam bin Abdulaziz University in the Kingdom of Saudi Arabia (KSA) and the University of the Witwatersrand in Johannesburg, South Africa (SA). To facilitate this comparison, data were gathered from two independent samples representing each institution. Specifically, a valid sample of 211 respondents was obtained from the KSA university, while 191 valid responses were collected from the SA counterpart. The empirical analysis employed both independent sample t-tests and structural equation modelling (SEM). The results indicate a statistically significant disparity in faculty teaching practices between the two universities. Conversely, no significant variation was identified in relation to information literacy and the use of digital tools across the institutions. However, a marked difference was observed regarding the incorporation of indigenous knowledge into teaching practices. SEM analysis further demonstrates that, within the KSA context, information literacy and digital tools exert a significant and positive influence on the enhancement of faculty teaching practices in alignment with 21st-century skills. In contrast, the SA findings reveal that information literacy, digital tools, and indigenous knowledge collectively serve as meaningful contributors to the advancement of faculty teaching methods. These outcomes offer valuable policy implications for educational administrators and policymakers in both KSA and SA. The study also acknowledges certain limitations, which inform recommendations for future research directions.*

**Keywords:** Teaching Practices, 21st-Century Skills, Digital Tools, Information Literacy, Indigenous Knowledge.

## Introduction

It is defined by swift advances in education competencies, spanning disciplines such as science, technology, economics, politics, and social sciences. Due to these swift advances, it is important for nations to be proactive, and this necessitates them creating education and government policies aimed at augmenting human and material resources. Such initiatives are essential to prepare future generations with contemporary skills aligned with the demands of an evolving global landscape. In this context, higher education emerges as a central mechanism for adapting to these shifts. It plays a crucial role in preparing a skilled workforce capable of applying knowledge innovatively across diverse domains (Mahmud and Wong, 2022). This objective can be achieved by reforming educational structures to improve academic quality in alignment with modern societal and labour market needs. This involves updating curricula and adopting teaching methodologies that shift away from traditional instruction, favouring instead interactive models that cultivate critical thinking, creativity, and problem-solving among learners (Anasel and Swai, 2023).

A foundational aspect of this transformation is the preparation and professional development of university teaching staff. Research indicates that conventional teaching methods are insufficient to address the competencies required in today's educational environment (Ramaila and Molwele, 2022). Consequently, faculty members must undergo targeted training to align with 21st-century pedagogical demands. According to the Partnership for 21st Century Learning (P21), essential skills include critical thinking, collaboration, information and media literacy, technological fluency, social competencies, leadership, responsibility, economic and business understanding, adaptability, initiative, self-regulation, and global awareness. It is by investing such qualities in teachers that they become innovative and influential professionals who can inculcate critical thinking and creativity among learners. In Saudi Arabia's particular case, it is important that teachers mirror such qualities to realize the optimal education outcomes among teachers and learners alike (Herlinawati et al., 2024).

At an institutional level, it is in education institutions' best interests to be well prepared to cater to this modern age's shifting needs. This extends to the development of new scholarly programs to support interactive learning environments and implementing newly emerging education technologies to enhance student engagement (Yeoh et al., 2025). Thus, improving the quality of educational delivery should be a top strategic objective for these institutions to achieve the intended results of the learning process. The instruction of 21st-century competencies has garnered increasing interest within the educational community due to its potential to enhance both academic achievement and future career readiness (Moshinski et al., 2021). Empirical findings have demonstrated a statistically significant link between faculty performance evaluations and improvements in educational outcomes. Furthermore, Chibuwe and Munoriyarwa (2023) recommend that research should be conducted to assess faculty teaching practices, with the results informing professional development efforts. A number of studies also emphasise the importance of understanding current teaching practices in relation to 21st-century skill integration (Bolat and Deneme Gençoğlu, 2024).

However, the existing body of literature reveals a limited focus on how university-level instructors incorporate 21st-century competencies into their pedagogy. Most research has predominantly concentrated on primary and secondary education. To date, only two investigations have specifically examined this issue within the context of university faculty: one conducted by Birru (2024) involving academics from Bisha University and Abyan University in Yemen. Notably, these studies produced divergent outcomes, suggesting a need for further exploration in other settings. Against this backdrop, the present study represents the first known attempt to investigate the teaching practices of faculty members at Prince Sattam bin Abdulaziz University through the lens of 21st-century competencies, as perceived by students. This focus on student perspectives is particularly relevant, given that learners are in the best position to assess the efficacy and real-world relevance of their instructors' pedagogical methods.

As to information literacy, Harrington and Scott (2023) describe that being information-competent is inseparably connected to being critically information literate. This strategy not only focuses on acquiring and navigating information, but it is equally concerned with understanding information's processes of dissemination and origins. In similar sentiment, prior studies highlighted communities' needs to critically evaluate information sources, as prior literature highlight an individual's task in navigating, processing, and utilizing information. Generally, information literacy consists in information competencies' suite required to identify, retrieve, evaluate, and apply knowledge in an effective manner. In addition, the concept of indigenous knowledge is broadly understood to be one type of localised knowledge. It is defined as a system of beliefs, practices, and knowledge systems intended to guide communities in natural and cultural resources management (Lutomia et al., 2019). This form of knowledge is typically developed through generations of close interaction with the natural environment. Mandikonza (2019) explored how indigenous knowledge contributes to the comprehension and delivery of scientific curricula, thus reinforcing its educational relevance.

The contributions to this research work are multi-faceted. Firstly, it is the first theory and evidence to conduct comparative investigation in terms of teacher practices among KSA and SA higher education institutions. A look at available literature reveals that, to date, research has not made faculty teacher practices a key outcome variable in this comparative context. Furthermore, this work adopts the structural equation modelling approach to analyse information

literacy, digital tools, and indigenous knowledge's contribution to 21st-century skill scope in terms of teacher practices. In addition, it offers multiple practical recommendations on facilitating teacher practices from specified explanatory variables.

# Literature Review

## Theoretical Framework and Previous Studies

The conceptual model for this study is framed in two key dimensions. The first explores the nature and scope of 21st-century skills, and the second addresses faculty members' approach to imparting such competencies.

## The Nature of 21st-Century Skills

Preparedness to meet all the dynamic needs and challenges in the 21st century demands an overall transformation in every aspect in the process of learning. Educating students to be actively involved in modern working environments and careers is something that demands concerted support that will equip students to learn and practice 21st-century competencies while, at the same time, learning about the pressing global challenges in the period (González-Pérez and Ramírez-Montoya, 2022). 21st-century competencies, according to Fouche and Andrews (2022), encompass a key cluster of competencies required to succeed in study, work, and society contexts. They encompass digital proficiency, learning for innovation, and life and career competencies. Furthermore, such competencies are not only cognitive but behavioural, and signify activities, experiences, and mental capacities that prepare learners to address contemporary demands. These encompass critical and creative thinking, communicative and co-operative strength, solving, technological proficiency, computational thinking, and broader skills in life and career planning (Al-Qawas and Al-Mansoori, 2021).

Greater emphasis in recent decades has been placed on such skills due to multi-faceted developments, e.g., scientific and technological advancements, globalisation of economies, acceleration in knowledge society, and growing socio-economic and environmental complexities. In addition, sustainable developmental goals and cultural diversity have gone to give further impetus to training such skills in education systems. Chimbunde (2023) gives centrality to education's needs to take on equity and quality enhancement through appropriate modalities of training. In this vein, multiple models have come to be drawn up in order to categorise 21st-century skills in discrete, if overlapping, categories. Haug and Mork (2021) identify several of these competencies, such as innovation and creativity, information handling, critical thinking, problem-solving, communication, collaboration, technological literacy, and digital citizenship. International Society for Technology in Education (ISTE) has in similar lines outlined an entire 21st-century readiness framework, in which it highlights skills like creativity, innovation, critical thinking, problem-solving, technological proficiency, information handling, communication, collaboration, and responsible digital use (Uyar, 2023). Correspondingly, in America, North Central Regional Educational Laboratory (NCREL) categorizes all such competencies in four primary categories, i.e., digital-age fluency, creative thinking, effective communication, and high-level productivity (Herlinawati et al., 2024).

Comparing these frameworks, 21st century competencies have been variably understood and described in school and institutional contexts. While those emphasize cognitive, e.g., creative and critical thinking, others emphasize technological knowledge, cultural competencies, and communication. While distinctions hold, in general, it seems to be common that such competencies emanate from higher order thinking, digital literacy, self-directed learning, and productive communication. In alignment with this understanding, the present study conceptualises the 21st-century skills expected of faculty members as comprising four key domains: advanced cognitive skills, digital proficiency, self-directed learning abilities, and communication effectiveness, all of which should be demonstrably integrated into teaching practices.

## Teaching Practices of Faculty Members Considering 21st-Century Skills

The faculty members form the key part in the organizational setup in the system of post-secondary learning institutions, for it is them that carry at the essence the primary mandate to educate. This is at the core of preparing students for later life in society through embedding specialized knowledge, positive attitudes, and core scientific and practical competencies (Ajuoga and Odhiambo, 2023). In this context, faculty are regarded as one of the most significant inputs into the higher education system, necessitating continual development in response to the ongoing advancements in information, communication, and

technology. Accordingly, establishing clear standards and evaluative frameworks to assess teaching practices has become imperative (Celik et al., 2023).

To effectively perform education obligations, lecturers should be equipped with competencies aligned to emerging advances in knowledge and technological progress in diverse sectors. Furthermore, lecturers should be provided with relevant tools and methodologies to transfer competencies to students to handle an ever-changing globe and an employment market demanding much more diverse credentials than in previous eras (Steinemann et al., 2021). All lecturers regardless of study disciplines should be engaged in constant professional development. This ongoing growth can be achieved through individual efforts to remain current, conducting scholarly research, attending academic conferences for knowledge exchange, and participating in training sessions, workshops, panel discussions, and collaborative research initiatives. These professional engagements play a substantial role in refining instructional competencies tailored to the demands of contemporary education (Chasubuta et al., 2024). In parallel, the contribution of higher education institutions in facilitating faculty training is of critical importance. These institutions serve as essential platforms for enhancing the capabilities of educators, thereby enabling them to effectively prepare students to meet the demands of their time. Ultimately, the success of this mission depends on the breadth and depth of skills faculty members possess (Gkrimpizi et al., 2023).

To this end, the scholar emphasizes imperatives in front of university teachers to remain always vigilant to the dynamic nature of their spaces where they teach. This obliges them to invest actively in terms of building deeper professional capacities so that resulting outcomes of learning cater better to 21st-century education's aspirations to produce a generation well-endowed in competencies. Such a generation will be well prepared to learn independently, to think critically, to create inventively, and therefore to match ongoing needs in the labour market and in other challenges in contemporary society. In this sense, this work endeavours to study the condition of faculty members' instructional practice in 21st-century competencies and to try to support embedding such competencies in university education through submitting evidence-informed observations and practical recommendations.

## Information Literacy and Faculty Teaching

The dynamic among information literacy (IL), student learning, and faculty instructional practices has attracted increasing interest among researchers and policymakers. Bury (2016) investigated faculty staff's conceptualisations of IL in reaction to the evolving digital information landscape. Specifically, it investigated teachers' definitions of IL in undergraduate education and what teachers believe students ought to grow and demonstrate in this area. Through data collected from 24 semi-structured interviews among faculty staff who represent a large diversity of disciplines in one large public research campus in Toronto, it is identified that IL is perceived among faculty staff to be in close correspondence with wider-level disciplinary abilities. It is regarded as vital for enabling students to engage successfully in their academic pursuits and for cultivating autonomy and active learning. In particular, the faculty emphasised the importance of nurturing advanced cognitive capacities, including critical thinking, analytical questioning, and the ability to assess, contextualise, and synthesise information. It also identified an apparent gap in IL competencies in students and commented on the shared responsibility among librarians and academic staff in supporting students' IL growth.

Correspondingly, Hammons (2020) referred to pedagogical IL instruction methodologies, i.e., in one model, "teach the teachers". There, librarians focus on faculty professional education in certain discipline areas, such that faculty get trained to incorporate IL education in courses. The paper took a survey of several case studies to analyse such an approach's implications for librarians, faculty, and student success. The findings suggest that the "teach the teachers" model has promising potential to enhance the integration of IL across academic programmes. Nevertheless, the study also called for further empirical investigation to evaluate the long-term influence of this approach on teaching practices and the sustained improvement of students' IL skills.

## Indigenous Knowledge and Faculty Teaching

The inclusion of indigenous knowledge in teacher learning and teacher education among education faculty members has been researched in multiple research articles. Yip and Chakma (2024), for instance, conducted an in-depth study on initial teacher education (ITE) programs, i.e., observing in which way such programs incorporate indigenous knowledge. In doing this, it not only considered integration at the curriculum level but even at the level of strategies to teach to equip pre-

teachers to teach effectively from indigenous contents. While multiple ITE programs were noted to incorporate indigenous knowledge, this study heavily focused on the crucial requirement to streamline strategies in teaching to effectively teach this content. Moreover, the authors advocated for the establishment of more robust partnerships with indigenous communities and stressed the critical importance of involving indigenous knowledge holders in teacher preparation efforts. It emphasized ongoing reflective practice and rigorous programme evaluation in ITE to prepare potential teachers to be confident and competent in presenting indigenous content, while remaining attentive to Indigenous students' and communities' education requirements and cultural contexts.

Another relevant paper to this work by Hart et al. (2012) explored indigenous knowledge in the school context in Australia, in "the cultural interface"—the area of complication and tension. The study observed that indigenous knowledge systems become sidelined and challenged in legitimacy in dominant intellectual debates. The authors argued that to teach Indigenous studies in an effective manner, it is crucial to scrutinize Western epistemologies of what counts as valid knowledge. It further described in detail the experiences and responses to such tensions among pre-service teachers in Australia, discovering difficulties encountered among them in validating and consolidating cultural knowledge in contexts of education with great predominance of Western orientations.

## Digital Tools and Faculty Teaching

Integrating digital tools and digital technologies in teacher education in further education colleges has been an influential and vibrant area of study. In one such work, Amhag et al. (2019) conducted a survey among two Swedish universities to know to what extent digital tools were being used among teacher educators and to what extent digital competencies among them could be developed. To achieve the aims of research, the authors designed an online digital survey to be conducted among 405 teacher educators in two colleges, and 105 replies were received. Both closed and open-ended questions had been covered in 16 items, which comprised the survey. The study had been conceptualized in terms of the Technological Pedagogical Content Knowledge (TPACK) model and in terms of computer self-efficacy. The results revealed that most teacher educators did not extensively utilise digital tools for pedagogical purposes, highlighting a substantial need for support in the development of digitally enriched teaching practices. Moreover, in this research, not knowing about the pedagogical possibilities of digital applications proved to be an inhibiting factor in terms of motivation. The findings identified observing subject matter applications and best practices in experienced teachers' contexts could increase motivation and encourage implementation.

Similarly, Mei et al. (2019) investigated digital learning tool usage among university instructors, including what impact such tools have on post-secondary pedagogical practice. The study also investigated knowledge-sharing cultures among faculty professionals and organizational environments. With a qualitative study design, the study applied semi-structured interviews in one Norwegian institution of higher education. The research was also framed by the TPACK model, which explores the intersection of technological integration, pedagogical strategies, and subject matter expertise. Findings indicated that faculty members view digital tools as instrumental in promoting active student engagement and facilitating learner-centred pedagogies. Their use of technology was driven by the goal of enhancing student motivation and encouraging reflective teaching. Additionally, the study, drawing on the Professional Learning Communities theory, highlighted that structured, formal settings were more conducive to professional knowledge sharing among educators, while informal sharing environments presented more challenges.

## Methods and Material

A structured questionnaire was designed as the primary data collection instrument for this study, with detailed specifications presented in Table 1. The measurement scales for the constructs related to faculty teaching practices, information literacy, and indigenous knowledge were adapted from existing literature, while the scale for digital tools was developed specifically for this research, as indicated in the footnote of Table 1. Data were subsequently gathered through the administration of this survey instrument. Initially, a total of 250 questionnaires were distributed across the two selected universities. From the KSA, 211 completed questionnaires were retrieved, whereas 194 valid responses were obtained from the South African sample. The empirical analysis proceeded with an Independent Samples T-test, followed by a two-step analytical approach utilising SmartPLS software (version 4.0).

**Table 1:** Variables and Measurements.

| Variable | Nature | Measurement Source |
|---|---|---|
| Faculty Teaching Practices | Dependent Variable | (Wilcox et al., 2017) |
| Information Literacy | Independent | (Serap Kurbanoglu et al., 2006) |
| Indigenous Knowledge | Independent Variable | Adapted from: (Lutomia, et al., 2019) |
| Digital Tools | Independent Variable | Self-Development* |
| *1. How often do you use digital tools (e.g., online learning platforms, educational apps, virtual classrooms) in your teaching? (Options: Never, Rarely, Occasionally, Frequently, Always), 2. To what extent do digital tools enhance your ability to engage students and facilitate learning in your classroom? (Options: Not at all, to a small extent, to a moderate extent, To a large extent, Completely), 3. How confident are you in your ability to effectively integrate digital tools into your teaching practices? | | |

# Results and Discussion

## Independent Samples T-Test Analysis

This section presents a detailed discussion of the results derived from the Independent Samples T-test, conducted to compare the two universities in the KSA and South Africa across four key variables. The statistical outcomes, along with the corresponding hypotheses, are outlined below.

## Faculty Teaching Practices

$H_0$: No significant difference exists in faculty teaching practices between KSA and South Africa universities.

$H_1$: A significant difference exists in faculty teaching practices between KSA and South African universities.

## Information Literacy

$H_0$: No significant difference exists in information literacy between KSA and South African universities.

$H_2$: A significant difference exists in information literacy between KSA and South African universities.

## Indigenous Knowledge

$H_0$: No significant difference exists in indigenous knowledge between KSA and South African universities.

$H_3$: A significant difference exists in indigenous knowledge between KSA and South African universities.

## Digital Tools

$H_0$: No significant difference exists in the use of digital tools between KSA and South African universities.

$H_4$: A significant difference exists in the use of digital tools between KSA and South African universities.

According to results tabulated in Table 2, describing the procedure for Independent Samples T-test, whether statistically significant differences exist between samples from KSA and South Africa, this study tested on all variables in consideration. The procedure indicates that in faculty teaching practices, 0.023 is provided by t-statistic, which is smaller than 5% level of significance. There is thus, the presence of statistically significant difference between both schools regarding faculty teaching practices. In contrast, the findings for information literacy reveal a p-value of 0.266, which exceeds the 5% significance level, indicating no statistically significant difference between the universities in KSA and South Africa concerning this variable. With regard to indigenous knowledge, the t-statistic is reported as 3.45, accompanied by a p-value of 0.004. As this value is well below the conventional 0.05 threshold, the results confirm a significant difference between the two groups. This implies that the perception, application, or integration of indigenous knowledge differs markedly between the two university systems. Therefore, indigenous knowledge emerges as a domain where a statistically significant divergence exists between higher education institutions in KSA and South Africa.

**Table 2:** T-Test Results.

| Variable | T-Statistic | P-Value | Conclusion |
|---|---|---|---|
| Faculty Teaching Practices | 2.34*** | 0.023 | Significant difference between KSA and SA, H1 supported. |
| Information Literacy | 1.12[NS] | 0.266 | No significant difference, H2 not supported. |
| Indigenous Knowledge | 3.45*** | 0.004 | Significant difference between KSA and SA, H3 supported. |
| Digital Tools | -0.89[NS] | 0.387 | No significant difference, H4 not supported. |
| Note: NS means not significant. | | | |

## Analysis of the Structural Model

The structural model outcomes for the first sample, derived from the university in the KSA, are presented in Table 4. This table details the path coefficients, standard deviations, t-values, and corresponding p-values. According to the results, the path coefficient reflecting the influence of information literacy on faculty teaching practices is 0.144, with a standard deviation of 0.013. The associated t-value is 11.07, which exceeds the critical threshold of 1.96, resulting in a p-value of 0.000. These findings confirm a statistically significant and positive relationship, indicating that information literacy plays a meaningful role in enhancing faculty teaching practices within the KSA university context. In contrast, the coefficient representing the influence of indigenous knowledge on faculty teaching practices is -0.058, accompanied by a standard deviation of 0.059. The t-value is 0.978, which falls below the required threshold of 1.96, and the associated p-value is 0.328. This indicates that the relationship is statistically insignificant at both the 1% and 5% significance levels.

Consequently, it can be inferred that indigenous knowledge does not exert a notable influence on faculty teaching practices in the KSA university setting, suggesting limited integration of this knowledge form into contemporary pedagogical approaches. The third path in the model reflects the impact of digital tools on faculty teaching practices. The coefficient for this relationship is 0.669, with a standard deviation of 0.055. The corresponding t-value is 12.185, which substantially exceeds the critical value of 1.96, and the p-value is 0.000, denoting high statistical significance. These results affirm that the use of digital tools has a strong and positive influence on faculty teaching practices in KSA universities. Increased adoption and integration of digital technologies appear to significantly enhance instructional effectiveness in the context of 21st-century education.

**Table 4:** KSA University Faculty.

| Paths | Original Sample | Standard Deviation | T Statistics | P Values |
|---|---|---|---|---|
| INL -> FTP | 0.144 | 0.013 | 11.077 | 0.000 |
| DTN -> FTP | 0.669 | 0.055 | 12.185 | 0.000 |
| INK -> FTP | -0.058 | 0.059 | 0.978 | 0.328 |

The results in the structural model among Prince Sattam bin Abdulaziz University faculty staff in KSA shed crucial lights on predictors influencing faculty members' teachers' behaviors in adherence to 21st-century competencies. The results suggest that there is a statistically significant and positive correlation in teachers' practices and information literacy. In other words, this suggests that faculty staff having enhanced capacities to identify, evaluate, and include valid and relevant information will be in better positions to improve the quality of instructions. Specifically, information literacy allows teachers to include diverse study materials and remain up to date in terms of latest scholarly outputs, accelerating effective and vibrant instructions. This impact is actualized through knowledgeable utilization of digital materials and learning contents, an area that leads to enhanced student engagement and learning performances. Conversely, the relationship between indigenous knowledge and faculty teaching practices was found to be statistically insignificant, as indicated by a p-value exceeding the conventional 5% significance threshold. This absence of significance may be attributed to several factors. One plausible explanation is the predominant emphasis of academic programmes on globally oriented or modern curricula, which may marginalise or exclude indigenous perspectives. Another potential reason is the limited availability of professional development opportunities or training for faculty members on how to effectively integrate indigenous knowledge into instructional design and delivery. As a result, this knowledge domain remains underutilised in pedagogical practice.

In contrast, DTL demonstrated a strong and statistically significant influence on faculty teaching practices, with a path coefficient of 0.669 and a p-value of 0.000. The DTL construct encompasses various technological resources, including multimedia applications, virtual learning environments, and online collaborative platforms, all designed to support and enhance instructional activities. The positive association indicates that integrating these digital tools enables faculty to more efficiently organise, present, and disseminate instructional content. As digital proficiency among educators increases, their ability to manage and leverage diverse educational

technologies also improves, thus advancing the quality of teaching practices within the higher education context in KSA. As illustrated in Figure 1, the model's explanatory power, measured by the $R^2$ value, is 0.485. This indicates that the combined influence of information literacy, digital tools, and indigenous knowledge accounts for approximately 48.5% of the variance observed in faculty teaching practices, thereby reflecting a moderate level of predictive strength.
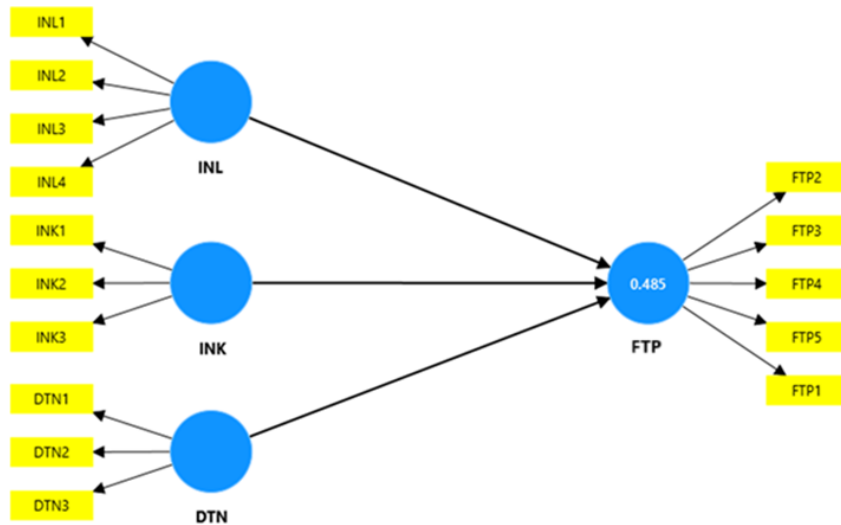


**Figure 1:** Explanatory Power of the Model.

The second sample, obtained from the University of the Witwatersrand, Johannesburg, was analysed, and the corresponding results are presented in Table 5. The structural path from DTN to FTP is recorded at 0.214, supported by a t-value of 3.984 and a p-value of 0.000. This indicates a statistically significant and positive effect, suggesting that the incorporation of DTN contributes effectively to improving FTP within the South African university context. The positive association reflects that increased use of technological tools enhances faculty capability in delivering content, structuring lessons, and engaging students more effectively. In terms of INK, the model reports a coefficient of 0.353, with a standard deviation of 0.063 and a t-value of 5.614. The p-value remains at 0.000, confirming that this relationship is also statistically significant. This suggests that additional focus on integrating INK in education is linked to apparent teacher practice improvements. Such integration may include embedding cultural stories, customary perspectives, or community knowledge in curricula, diversifying student knowledge and applicability to classroom practice.

Moreover, the structural path from INL to FTP is computed to be 0.363, while corresponding standard deviation and t-value stand at 0.068 and 5.328, and p-value 0.000. These findings indicate a strong and statistically significant correlation, such that faculty members competent in INL tend to be better in utilizing diverse sources of information, utilizing relevant digital tools, and demonstrating content precision and relevance, and therefore enhancing overall quality in their teaching practices. As shown in Figure 2, the model demonstrates great explanatory power, such that the $R^2$ measure stands at 0.684. This indicates that 68.4% of FTP's variance is accounted for in terms of the aggregated influence exercised by DTN, INK, and INL in the contexts of South African higher education.

**Table 5:** SA University Faculty.

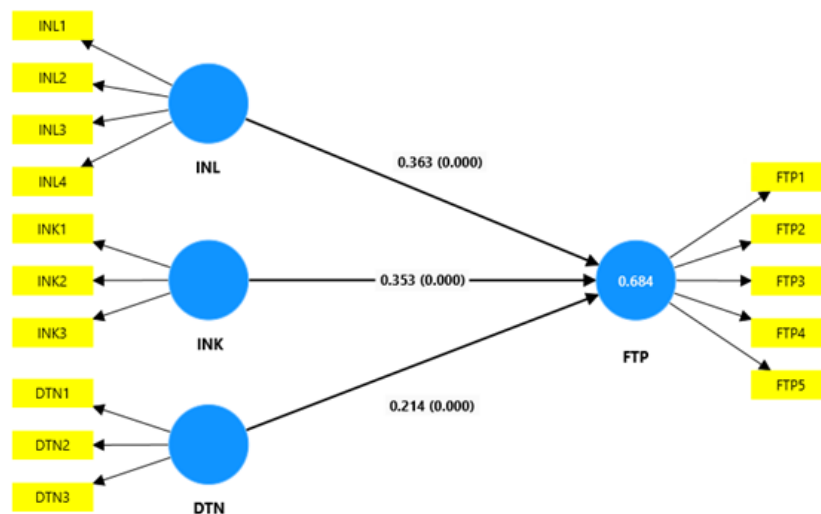|  | Original Sample (O) | Standard Deviation (STDEV) | T Statistics (|O/STDEV|) | P Values |
|---|---|---|---|---|
| DTN -> FTP | 0.214 | 0.054 | 3.984 | 0.000 |
| INK -> FTP | 0.353 | 0.063 | 5.614 | 0.000 |
| INL -> FTP | 0.363 | 0.068 | 5.328 | 0.000 |

**Figure 2:** Path Output with R2.

## Conclusion

This study offers a preliminary comparative examination of FTP and predictors at two universities in KSA and South Africa. The findings suggest that in KSA, INL and DTN have significant overall additive contributions to FTP, such that selective investment in training in 21st-century competencies is merited. Teachers should be guided by organized professional growth programs in leveraging digital resources to cultivate critical thinking, teamwork, and problem-solving. In South Africa, INL, DTN, and INK all have overall positive contributions to FTP, such that an overall framework encompassing these variables in both faculty growth and curriculum design may be merited. Promoting a collaborative academic culture is also essential for enhancing pedagogical practices. However, the study's scope is limited to one institution per country and relies solely on quantitative analysis. It also omits emerging themes such as artificial intelligence, learning analytics, and information governance. Future research should address these gaps to offer broader policy insights and strengthen contributions to the literature.

### Acknowledgments

## References

Ajuoga, M. A. and Odhiambo, O. R. (2023). Prospects of the 21st Century Skills in Education: an implication for Competency Based Curriculum in Kenya. *International Journal of Research and Innovation in Social Science*, 7(11): 1571-1581. https://doi.org/10.47772/IJRISS.2023.7011122

Al-Qawas, M. A. M. and Al-Mansoori, S. K. A. (2021). The Role of Colleges of Education at Yemeni Universities in Providing Student Teachers with the Twenty-First Century Skills. *Journal of Educational and Psychological Sciences*, 4(47): 1-24. https://doi.org/10.26389/AJSRP.Q111120

Amhag, L., Hellström, L. and Stigmar, M. (2019). Teacher Educators' Use of Digital Tools and Needs for Digital Competence in Higher Education. *Journal of Digital Learning in Teacher Education*, 35(4): 203-220. https://doi.org/10.1080/21532974.2019.1646169

Anasel, M. G. and Swai, I. L. (2023). Factors to determine the adoption of online teaching in Tanzania's Universities during the COVID-19 pandemic. *PLOS ONE*, 18(10): e0292065. https://doi.org/10.1371/journal.pone.0292065

Birru, Y. T. (2024). The Integration of 21st-Century Skills into the Higher Education Curriculum: Practices and Perspectives Systematic Review. *Teacher Education and Curriculum Studies*, 9(3): 60-68. https://doi.org/10.11648/j.tecs.20240903.12

Bolat, Y. and Deneme Gençoğlu, S. (2024). The Integration of 21st Century Skills into Secondary School English Classes and the Challenges faced by Teachers. *International Journal of Contemporary Educational Research*, 11(1): 36-54. https://doi.org/10.52380/ijcer.2024.11.1.558

Bury, S. (2016). Learning from faculty voices on information literacy. *Reference Services Review*, 44(3): 237-252. https://doi.org/10.1108/RSR-11-2015-0047

Celik, I., Gedrimiene, E., Silvola, A. and Muukkonen, H. (2023). Response of learning analytics to the online education challenges during pandemic: Opportunities and key examples in higher education. *Policy Futures in Education*, 21(4): 387-404. https://doi.org/10.1177/14782103221078401

Chasubuta, A. R., Ndibalema, P. M. and Loisulie, P. (2024). Technological literacy in using Learning Management System among students in higher education institutions Tanzania: the case of two selected universities. *Educational Technology Quarterly*, 2024(1): 76-96. https://doi.org/10.55056/etq.695

Chibuwe, A. and Munoriyarwa, A. (2023). Emerging Methods and Challenges Associated With Teaching and Learning Media Studies During the COVID-19 Pandemic Induced Lockdowns in Zimbabwe and South Africa. *SAGE Open*, 13(2): 21582440231167113. https://doi.org/10.1177/21582440231167113

Chimbunde, P. (2023). Funding the online teaching and learning in developing countries: insights from Zimbabwe. *Educational technology research and development*, 71(2): 753-766. https://doi.org/10.1007/s11423-022-10163-3

Fouche, I. and Andrews, G. (2022). "Working from home is one major disaster": An analysis of student feedback at a South African university during the Covid-19 lockdown. *Education and Information Technologies*, 27(1): 133-155. https://doi.org/10.1007/s10639-021-10652-7

Gkrimpizi, T., Peristeras, V. and Magnisalis, I. (2023). Classification of Barriers to Digital Transformation in Higher Education Institutions: Systematic Literature Review. *Education Sciences*, 13(7): 746. https://doi.org/10.3390/educsci13070746

González-Pérez, L. I. and Ramírez-Montoya, M. S. (2022). Components of Education 4.0 in 21st Century Skills Frameworks: Systematic Review. *Sustainability*, 14(3): 1493. https://doi.org/10.3390/su14031493

Hammons, J. (2020). Teaching the teachers to teach information literacy: A literature review. *The Journal of Academic Librarianship*, 46(5): 102196. https://doi.org/10.1016/j.acalib.2020.102196

Harrington, C. and Scott, R. E. (2023). Intersections of Open Access and Information Privilege in Higher Education and Beyond. *Faculty and Staff Publications – Milner Library*, article no. 193. [Online]. https://doi.org/10.3998/nasig.4302

Hart, V., Whatman, S., McLaughlin, J. and Sharma-Brymer, V. (2012). Pre-service teachers' pedagogical relationships and experiences of embedding Indigenous Australian knowledge in teaching practicum. *Compare: A Journal of Comparative and International Education*, 42(5): 703-723. https://doi.org/10.1080/03057925.2012.706480

Haug, B. S. and Mork, S. M. (2021). Taking 21st century skills from vision to classroom: What teachers highlight as supportive professional development in the light of new demands from educational reforms. *Teaching and Teacher Education*, 100: 103286. https://doi.org/10.1016/j.tate.2021.103286

Herlinawati, H., Marwa, M., Ismail, N., Junaidi, Liza, L. O. and Situmorang, D. D. B. (2024). The integration of 21st century skills in the curriculum of education. *Heliyon*, 10(15): e35148. https://doi.org/10.1016/j.heliyon.2024.e35148

Lutomia, A. N., Bello-Bravo, J., Njoroge, T. M. and Pittendrigh, B. R. (2019). Beyond Binaries of Scientific and Indigenous Knowledge Bean Storage Techniques: A Case of Market Women in Ghana. In: S. Hameed, S. El-Kafafi, & R. Waretini-Karena (Eds.), *Handbook of Research on Indigenous Knowledge and Bi-Culturalism in a Global Context*. IGI Global Scientific Publishing, pp. 38-60. https://doi.org/10.4018/978-1-5225-6061-6.ch004

Mahmud, M. M. and Wong, S. F. (2022). Digital age: The importance of 21st century skills among the undergraduates. *Frontiers in Education*, 7: 950553. https://doi.org/10.3389/feduc.2022.950553

Mandikonza, C. (2019). Integrating indigenous knowledge practices as context and concepts for the learning of curriculum science: A methodological exploration. *Southern African Journal of Environmental Education*, 35: 1-16. https://doi.org/10.4314/sajee.v35i1.13

Mei, X. Y., Aas, E. and Medgard, M. (2019). Teachers' use of digital learning tool for teaching in higher education. *Journal of Applied Research in Higher Education*, 11(3): 522-537. https://doi.org/10.1108/JARHE-10-2018-0202

Moshinski, V., Pozniakovska, N., Mikluha, O. and Voitko, M. (2021). Modern education technologies: 21st century trends and challenges. *SHS Web of Conferences*, 104: 03009. https://doi.org/10.1051/shsconf/202110403009

Ramaila, S. and Molwele, A. J. (2022). The Role of Technology Integration in the Development of 21st Century Skills and Competencies in Life Sciences Teaching and Learning. *International Journal of Higher Education*, 11(5): 9-17. https://doi.org/10.5430/ijhe.v11n5p9

Serap Kurbanoglu, S., Akkoyunlu, B. and Umay, A. (2006). Developing the information literacy self-efficacy scale. *Journal of Documentation*, 62(6): 730-743. https://doi.org/10.1108/00220410610714949

Steinemann, S., Korndorffer, J., Dent, D., Rucinski, J., Newman, R. W., Blair, P. *et al.* (2021). Defining the need for faculty development in assessment. *The American Journal of Surgery*, 222(4): 679-684. https://doi.org/10.1016/j.amjsurg.2021.06.010

Uyar, A. (2023). 21st Century Skills of Pre-service Teachers and Visions of Faculties of Education in Acquiring 21st Century Skills. *International Journal of Contemporary Educational Research*, 10(1): 262-278. https://doi.org/10.33200/ijcer.1274201

Wilcox, D., Liu, J. C., Thall, J. and Howley, T. (2017). Integration of Teaching Practice for Students' 21st Century Skills: Faculty Practice and Perception. *International Journal of Technology in Teaching and Learning*, 13(2): 55-77. https://sicet.org/main/wp-content/uploads/2018/10/1_Wilcox_Liu.pdf

Yeoh, H. B., Wei, C. Y., Kaur, S. and Kaur, M. (2025). Examining inter-relationships among 21st century learning skills and their impacts on tertiary learners' readiness for careers in Industry Revolution 4.0 era. *Higher Education, Skills and Work-Based Learning*, 15(3): 500-515. https://doi.org/10.1108/HESWBL-03-2024-0086

Yip, S. Y. and Chakma, U. (2024). The teaching of Indigenous knowledge and perspectives in initial teacher education: a scoping review of empirical studies. *Journal of Further and Higher Education*, 48(3): 287-300. https://doi.org/10.1080/0309877X.2024.2327029

**Professor Asma Abdulrahman Nami Alshaikh** is a distinguished faculty member at Prince Sattam bin Abdulaziz University in Saudi Arabia, where she serves as a professor of science curricula and teaching methods in the College of Education. She earned her Ph.D. in the Philosophy of Education, specializing in science curricula and teaching methods, from Princess Nourah bint Abdulrahman University in Riyadh. She also holds a master's degree in education with the same specialization from Yarmouk University in Jordan, and a bachelor's degree in education, majoring in biology, from King Abdulaziz University in Medina.

Professor Al-Sheikh has held several academic and administrative leadership roles, including Vice Dean for Academic and Educational Affairs, Head of the Department of Curricula and Teaching Methods, and Supervisor of various educational programs and development committees. Her research interests center on science education strategies, curriculum design, educational technology, and the application of contemporary learning theories.

She has played an active role in national and institutional educational projects, served on numerous academic standing committees, and supervised a wide range of graduate theses. Additionally, she is a peer reviewer for several academic journals and a contributing member of national committees for educational quality and assessment. Her professional work is distinguished by a deep commitment to advancing educational quality and fostering innovative instructional practices.