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Using an Explanatory Sequential Mixed-Methods Design to Examine How Lecturer Pedagogy Shapes the Market-Readiness of IT and Computer Science Students in Somali Universities

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Abstract

The expansion of the global digital economy has increased demand for graduates who possess both technical expertise and workplace readiness. This study investigates how lecturer pedagogy influences the market-readiness of Information Technology (IT) and Computer Science students in Somali universities. Using an explanatory sequential mixed-methods design, quantitative data were collected from 290 students through a structured questionnaire, followed by qualitative analysis of open-ended responses. Results indicate that while students report moderate to high confidence in foundational competencies such as teamwork, independent learning, and technical problem-solving, important gaps remain in practical application, real-world problem solving, and industry engagement. Qualitative findings highlight outdated curricula, limited laboratory resources, and weak university-industry collaboration as major barriers to graduate employability. The study concludes that Somali universities should strengthen project-based learning, modernize curricula, and develop structured partnerships with industry to enhance graduate employability and labor-market readiness.

Keywords: *Lecturer pedagogy; Graduate employability; Market readiness; IT education; Computer science education; Somalia*

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Introduction

The twenty-first century has witnessed unprecedented transformation in global labor markets, driven largely by technological advancement and digital economy expansion. Information Technology (IT) and Computer Science graduates are increasingly expected to possess not only theoretical knowledge but also practical competencies enabling immediate contribution to organizational productivity (Jackson, 2016). Universities worldwide face mounting pressure to align educational offerings with evolving industry demands, ensuring graduates transition smoothly from academic settings to professional environments (Tomlinson, 2017).

Within this context, lecturer pedagogy emerges as a critical determinant of student outcomes. Instructional strategies, assessment methods, and learning experiences facilitated by educators fundamentally shape students' acquisition of discipline-specific knowledge and transferable skills (Biggs & Tang, 2011). Pedagogical approaches emphasizing active learning, real-world problem-solving, and collaborative projects enhance employability prospects more effectively than traditional lecture-based instruction (Freeman et al., 2014).

In Somalia, higher education institutions face unique challenges preparing IT and Computer Science graduates for the workforce. Decades of conflict and institutional instability have hampered educational development, resulting in infrastructure deficits, curriculum obsolescence, and limited connections with industry stakeholders (Herald & Mohamed, 2020). Despite growing enrollment in technology-related programs, concerns persist regarding graduate quality and labor market alignment. Employers frequently report Somali graduates lack practical skills and professional competencies necessary for productive employment (World Bank, 2019).

This study addresses a significant gap in literature by systematically examining the relationship between lecturer pedagogy and student market-readiness within Somali higher education. While extensive research exists on graduate employability in developed nations, limited empirical evidence documents experiences of IT and Computer Science students in fragile and conflict-affected states. Understanding these dynamics is essential for informing educational policy, curriculum development, and pedagogical reform in Somalia and similar contexts.

2. Material & Methods

2.1 Research Design

This study employed an explanatory sequential mixed-methods design (Creswell & Plano Clark, 2018), consisting of two distinct phases. Quantitative data were collected first through a structured questionnaire to identify patterns between lecturer pedagogy and student market-readiness. Qualitative data were

subsequently gathered through open-ended questions to explain and contextualize quantitative findings. This design enables both generalizability through statistical analysis and depth through exploration of participant perspectives.

2.2 Population and Sampling

The target population comprised undergraduate and graduate students enrolled in IT and Computer Science programs at Somali universities. Given the absence of comprehensive sampling frames and geographical dispersion of institutions, convenience sampling was employed. The questionnaire was distributed electronically through university networks, student associations, and social media platforms frequented by computing students.

A total of 290 students completed the survey. The sample included students from both public and private universities across multiple Somali regions, providing reasonable diversity of institutional contexts.

2.3 Research Instrument

Data were collected using a structured questionnaire developed specifically for this study and administered through Google Forms. The instrument comprised seven sections: (1) demographic information, (2) teaching and learning practices (12 items), (3) teaching quality and support (8 items), (4) market-readiness and problem-solving ability (10 items), (5) institutional barriers (6 items), (6) university-industry collaboration (6 items), and (7) open-ended questions (4 items). Sections 2 through 6 utilized five-point Likert scales ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

2.4 Validity and Reliability

Content validity was established through systematic alignment of questionnaire items with existing literature on pedagogy, employability, and IT education. The instrument was reviewed by three academic peers with expertise in educational research and computing education to assess clarity, relevance, and comprehensiveness.

Reliability was assessed using internal consistency measures. Cronbach's alpha coefficients for Likert-scale sections ranged from 0.78 to 0.86, exceeding the 0.70 threshold generally considered acceptable for educational research (Taber, 2018).

2.5 Data Collection Procedures

Data collection occurred over a six-week period from February to March 2024. The questionnaire link was distributed through multiple channels, with two reminder messages sent at two-week intervals. Participation was voluntary and anonymous, with informed consent obtained through an initial screening question.

2.6 Data Analysis

Quantitative data were exported to IBM SPSS Statistics (Version 27) for analysis. Descriptive statistics (frequencies, percentages, means, standard deviations) were computed for all variables. Inferential

statistics, including independent samples t-tests and one-way ANOVA, examined differences based on demographic characteristics.

Qualitative data from open-ended responses were analyzed using thematic analysis following Braun and Clarke's (2006) six-phase framework: familiarization, initial coding, theme identification, theme review, theme definition, and report writing. Codes were developed inductively from participant responses and organized into broader thematic categories.

2.7 Ethical Considerations

All respondents were informed of the study's purpose, procedures, and their rights to withdraw without consequence. Anonymity was maintained throughout; no personally identifying information was collected. Data were stored securely with access restricted to the research team.

3. Results

Section A: Demographic Characteristics of Respondents (n = 290)

Characteristic	Category	Frequency (n)	Percentage (%)
Age Group	18-22 years	187	64.5
	23-27 years	76	26.2
	28 years and above	27	9.3
Gender	Female	198	68.3
	Male	92	31.7
Program	Computer Science	161	55.5
	Information Technology	129	44.5
Institution Type	Public University	112	38.6
	Private University	178	61.4
Year of Study	First Year	42	14.5
	Second Year	67	23.1
	Third Year	89	30.7
	Fourth Year and Above	92	31.7

Of 290 respondents, the majority (64.5%) were aged 18-22 years. Female students constituted 68.3% of the sample, suggesting strong female engagement in IT and Computer Science programs. Computer Science students (55.5%) slightly outnumbered IT students (44.5%). Private university students (61.4%) were more heavily represented than public university students (38.6%). Upper-level students (third year and above) comprised 62.4% of respondents, ensuring sufficient program exposure to provide informed perspectives.

Table 2: Teaching and Learning Practices (Pedagogy)

Item	Mean	SD	% Agree/Strongly Agree
Lecturers use real-world problems in teaching	3.84	0.92	71.4
Project-based learning is regularly used	3.76	0.98	68.6
Practical lab sessions are conducted frequently	3.58	1.12	61.7
Assessments focus on problem-solving abilities	4.02	0.84	79.3
Students design their own projects	3.12	1.24	45.5
Group work and collaboration are encouraged	3.91	0.88	74.5
Lecturers demonstrate practical applications	3.67	1.05	64.8
Teaching emphasizes theoretical concepts primarily	3.95	0.86	76.2

Results indicated generally positive perceptions of teaching practices, with mean scores above 3.5 for most items. The highest agreement was observed for "assessments focus on problem-solving abilities" (79.3% agree/strongly agree) and "teaching emphasizes theoretical concepts primarily" (76.2% agree/strongly agree). The item "students design their own projects" received the lowest mean score (3.12) and agreement percentage (45.5%), indicating limited opportunities for learner autonomy. Practical lab sessions, while positively rated by most (61.7% agreement), showed considerable variation across institutions (SD = 1.12).

Table 3: Teaching Quality and Academic Support

Item	Mean	SD	% Agree/Strongly Agree
Courses develop relevant job-market skills	3.72	0.96	67.9
Lecturers provide constructive feedback	3.88	0.89	73.1
I understand real-world relevance of coursework	3.94	0.85	76.9
Workload is manageable	3.21	1.18	48.6
Sufficient time for applied practice is available	3.34	1.14	52.4
Lecturers are accessible for academic support	3.79	0.94	70.3
Teaching methods are engaging and interactive	3.61	1.02	62.1

Students reported moderate to high satisfaction with teaching quality. The highest agreement (76.9%) was recorded for understanding real-world relevance of coursework. Constructive feedback from lecturers was also positively rated (73.1% agreement). However, workload manageability (48.6% agreement) and sufficient time for applied practice (52.4% agreement) emerged as concerns, with substantial variation in student experiences (SD = 1.18 and 1.14 respectively).

Table 4: Market-Readiness and Problem-Solving Ability

Item	Mean	SD	% Agree/Strongly Agree

Confident solving technical problems	3.82	0.91	72.4
Can work effectively in teams	3.96	0.84	78.6
Can learn new technologies independently	3.88	0.88	75.2
Confident presenting technical solutions	3.41	1.08	54.5
Can apply theory in complex real-world contexts	3.38	1.11	52.8
Prepared for immediate employment upon graduation	3.45	1.09	56.2
Possess skills demanded by employers	3.58	1.03	61.4
Can manage time and prioritize tasks effectively	3.71	0.95	68.3

Students expressed moderate to high confidence in several areas, particularly teamwork (78.6% agreement), independent learning of new technologies (75.2%), and technical problem-solving (72.4%). However, comparatively lower confidence was observed for presenting technical solutions (54.5% agreement), applying theory in complex real-world contexts (52.8%), and immediate employment preparedness (56.2%).

Table 5: Barriers and Institutional Challenges

Item	Mean	SD	% Agree/Strongly Agree
Laboratory resources are outdated/inadequate	3.91	0.94	74.8
Limited internship opportunities exist	4.12	0.88	82.4
Curriculum content is outdated	3.68	1.05	65.5
Institutional policies restrict practical learning	3.52	1.08	59.3
Funding limitations affect program quality	3.94	0.91	76.9
Limited access to modern software/tools	3.78	1.02	70.7

Limited internship opportunities emerged as the most significant barrier, with 82.4% of students agreeing that such opportunities are insufficient. Funding limitations (76.9% agreement) and inadequate laboratory resources (74.8% agreement) were also widely endorsed. Curriculum out datedness (65.5% agreement) and restricted access to modern software and tools (70.7% agreement) further compounded these barriers.

Table 6: University-Industry Collaboration

Item	Mean	SD	% Agree/Strongly Agree
University organizes career events with employers	2.89	1.24	34.5
Industry professionals visit classes/guest lecture	2.71	1.28	29.3
Internship programs are available through university	2.58	1.32	26.2
Curriculum is informed by industry input	2.92	1.19	36.9

Industry-sponsored projects are available	2.44	1.26	22.4
University facilitates networking with employers	2.67	1.30	28.6

Responses indicated consistently weak engagement between universities and industry stakeholders. All collaboration items received mean scores below 3.0, with agreement percentages ranging from 22.4% to 36.9%. The lowest-rated item, "industry-sponsored projects are available," garnered only 22.4% agreement, highlighting the absence of structured opportunities for students to engage with real-world industry challenges.

Table 7: Qualitative Themes and Representative Quotations

Theme	Representative Quotations
Theory-Practice Gap	"We learn many concepts in lectures, but we rarely get to implement them. When I try to write code, I realize I don't know how to start." (CS student, Year 3)
	"Everything is about passing exams. We memorize definitions and algorithms, but we never build real systems." (IT student, Year 4)
Resource Constraints	"Our computer lab has machines that are ten years old. Some don't work. The software we use is outdated." (CS student, Year 2)
	"Internet is a big problem. We cannot access online resources, watch tutorials, or use cloud platforms." (IT student, Year 3)
Desire for Industry Exposure	"We need internships. Even if they are unpaid, we need to see how companies work and what they expect from graduates." (CS student, Year 4)
	"If companies would come to our university and talk to us, we would know what skills to focus on." (IT student, Year 2)
Recommendations	"Make projects part of every course. Not just small assignments, but real projects where we build something useful." (CS student, Year 3)
	"Update the curriculum. Some courses teach technologies that are no longer used." (IT student, Year 4)
	"Create partnerships with IT companies. They can tell us what they need, offer internships, and maybe hire us." (CS student, Year 4)

Table 8: Significant Differences by Program and Institution Type

Variable	Group	Mean	SD	t-value	p-value
Technical Problem-Solving Confidence	Computer Science	3.94	0.86	2.54	< 0.05
	Information Technology	3.67	0.96		
Courses Develop Job-Market Skills	Information Technology	3.84	0.88	2.01	< 0.05
	Computer Science	3.62	1.01		
Access to Practical Lab Sessions	Private University	3.72	1.04	2.67	< 0.01

	Public University	3.36	1.21

Independent samples t-tests revealed significant program differences. Computer Science students reported higher confidence in technical problem-solving ($M = 3.94$, $SD = 0.86$) compared to IT students ($M = 3.67$, $SD = 0.96$), $t(288) = 2.54$, $p < 0.05$. Private university students reported better access to practical lab sessions ($M = 3.72$, $SD = 1.04$) than public university students ($M = 3.36$, $SD = 1.21$), $t(288) = 2.67$, $p < 0.01$.

4. Discussion

4.1 Interpretation of Findings

This study reveals a complex picture of strengths and gaps in Somali computing education. Students' confidence in technical problem-solving, teamwork, and independent learning suggests current pedagogical approaches successfully develop foundational competencies. These findings align with research emphasizing collaborative learning and autonomous skill development in computing education (Robins et al., 2003; Lye & Koh, 2014). Students' understanding of coursework relevance (76.9%) indicates effective communication of real-world connections.

A conceptual diagram showing:

- Input: Current Pedagogy (theoretical emphasis)
- Outputs: Strong foundational competencies (teamwork, independent learning), Weak professional application competencies (presenting, contextual application)
- Barriers: Resource constraints, limited industry collaboration]

However, gaps in presenting technical solutions, applying theory in complex contexts, and employment preparedness reveal pedagogical limitations. Students may possess declarative knowledge without sufficient procedural or conditional knowledge for professional performance (Alexander et al., 1991). Limited student-designed projects (45.5%) indicate constrained learner autonomy, potentially limiting creativity and self-direction valued by employers (Bennett, 2002).

4.2 Barriers to Market-Readiness

The barriers identified reflect systemic challenges facing Somali higher education. The finding that 82.4% identify limited internship opportunities as a barrier is particularly significant, given research demonstrating work-integrated learning substantially enhances graduate employment outcomes (Jackson, 2016). Without professional exposure, students lack opportunities to develop workplace norms, professional networks, and contextual understanding essential for successful employment transition (Smith et al., 2014).

Table 9: Barrier Severity Ranking

Rank	Barrier	Agreement (%)	Impact Level

1	Limited internship opportunities	82.4	Critical
2	Funding limitations	76.9	High
3	Inadequate laboratory resources	74.8	High
4	Limited access to modern software/tools	70.7	High
5	Curriculum outdatedness	65.5	Moderate
6	Institutional policies restricting practice	59.3	Moderate

Curriculum out datedness (65.5%) represents another critical barrier, particularly in technology fields where knowledge evolves rapidly. The lag between academic content and industry practice reflects broader challenges in curriculum development processes that fail to incorporate employer input (Kruss et al., 2015).

4.3 University-Industry Collaboration Deficit

With all collaboration items below 40% agreement, findings reveal an educational ecosystem disconnected from employer engagement. This deficit has profound implications, given research demonstrating strong partnerships enhance curriculum relevance, provide authentic learning opportunities, and facilitate graduate recruitment (Healy et al., 2012; Petersen et al., 2016). The absence of industry-sponsored projects (22.4%) and internships (26.2%) means students graduate without portfolios of practical work or professional experience.

4.4 Gender Dimensions

The high proportion of female respondents (68.3%) contrasts with typical computing program gender distributions globally (Cheryan et al., 2017). This finding suggests either sampling bias or genuine gender parity in Somali computing programs. If the latter, Somali universities may offer lessons for increasing female participation in technology fields.

4.5 Comparison with International Research

Gaps identified mirror challenges documented in other developing contexts (McGrath et al., 2020; Pillai et al., 2018). However, the collaboration deficit magnitude in Somalia appears particularly severe, reflecting prolonged conflict and institutional fragmentation limiting employer engagement.

4.6 Limitations

This study has several limitations. Convenience sampling limits generalizability. Self-reported market-readiness may not correspond to objective competency assessments or employer evaluations. The study captures student perceptions at a single point, providing no longitudinal evidence of employment outcomes. Lecturer and employer perspectives were not included. Cross-sectional design precludes examination of pedagogical evolution or reform impacts.

5. Conclusions and Recommendations

5.1 Conclusions

This study demonstrates that while theoretical instruction in Somali computing programs is generally well delivered, significant gaps exist in practical skill development, real-world problem-solving, and industry engagement. Students express moderate confidence in technical abilities but doubt employment preparedness, particularly in presenting solutions and applying knowledge in complex contexts. Barriers including inadequate resources, limited internships, outdated curricula, and weak industry collaboration require comprehensive institutional responses. The near-absence of structured university-industry partnerships represents a critical weakness depriving students of authentic professional experiences essential for successful labor market transition.

5.2 Recommendations

For Universities: Implement curriculum reform integrating project-based and experiential learning; establish structured internship programs with clear learning objectives; develop faculty capacity through professional development; create industry advisory boards providing curriculum input; invest in laboratory infrastructure; facilitate industry-sponsored student projects.

For Policymakers: Develop national employability frameworks defining expected competencies; create incentives for university-industry collaboration; establish internship support schemes; invest in higher education infrastructure; promote gender equity in computing education.

For Development Partners: Support curriculum modernization through technical assistance; facilitate university-industry partnerships; fund faculty development programs; support infrastructure improvement; sponsor research on graduate

5.3 Future Research Directions

Longitudinal research tracking graduates into employment would establish relationships between pedagogical experiences and labor market outcomes. Comparative studies across Somali regions would identify contextual factors influencing effectiveness. Research incorporating employer perspectives would clarify expectations and inform curriculum design. Intervention studies evaluating specific pedagogical reforms would generate evidence for effective practice.

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