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# Developing Practical Capability Across Vocational ICT Education-to-Work Transitions in Bangladesh

**Mazed Minahi Khan, Wahid bin Ahsan**

## Abstract

This qualitative study examines how participants described practical capability developing across vocational ICT education and the transition into entry-level technology work in Bangladesh. It draws on 20 semi-structured interviews with 13 graduates and advanced students, four instructors and lab trainers, and three hiring-side participants whose accounts were used contextually. Participants described capability as developing unevenly across curriculum enactment, assessment, additional learning, industrial attachment, recruitment, and early workplace participation. Formal vocational education provided useful foundations in some cases, but opportunities for repeated practice, guidance, feedback, practical assessment, and engagement with unfamiliar technical problems shaped how curricular knowledge became usable capability. Assessment influenced what forms of capability became visible within formal provision and what certification could communicate, while additional learning through external courses, online resources, projects, peers, and further study extended capability beyond the formal program. Industrial attachment, recruitment, and early workplace participation exposed learners to different expectations concerning problem-solving, technical explanation, adaptability, communication, and response to feedback. These settings not only revealed prior preparation but also created opportunities for further development. The findings suggest that practical capability develops across interconnected educational and occupational settings rather than being completed within formal vocational education and subsequently transferred unchanged into work. For vocational ICT education, the study highlights the importance of connecting curriculum enactment, assessment, continued learning, and meaningful workplace participation across the education-to-work transition. Rather than treating transition as a simple skills mismatch, it provides a bounded account of how capability is formed, extended, demonstrated, and interpreted across education and work.

**Keywords:** vocational education; vocational ICT education; practical capability; education-to-work transition; workplace learning; Bangladesh

Userhub Ltd., Dhaka, Bangladesh

Corresponding Author:
Wahid bin Ahsan, Userhub Ltd., 72/A, Tejkunipara, Tejgaon, Dhaka 1215 Bangladesh.
Email: wahid.ahsan@gmail.com

# Introduction

Vocational education and training (VET) is expected to prepare learners for participation in occupations by developing knowledge, skills, judgment, and the capacity to act in work-relevant situations. This challenge is especially visible in information and communication technology (ICT), where tools, programming frameworks, documentation, production practices, and occupational requirements change rapidly. A central issue is therefore not only whether vocational curricula include relevant technical content, but whether learners can convert curricular exposure into capability that can be applied, extended, and demonstrated in practical settings.

This article uses practical capability as shorthand for the applied dimension of vocational competence rather than as a new theoretical construct. It refers to the ability to use vocational knowledge, technical skills, and judgment when addressing situations resembling entry-level ICT work. This may include interpreting requirements, using relevant tools, constructing or modifying technical artifacts, diagnosing problems, explaining decisions, responding to feedback, and continuing to learn as technologies and tasks change. Vocational competence research similarly treats competence as more than possession of isolated knowledge or procedures, emphasizing the integration of knowledge, skills, and dispositions in occupational contexts (Baartman et al., 2007; Winther & Achtenhagen, 2009). Recent work likewise conceptualizes competence as an integrated, situated, and developmental capacity observable through effective action across education and employment contexts (Lecours et al., 2026).

The distinction between curricular exposure and applied competence matters because the presence of technical content does not determine what learners can do with it. Training transfer depends on interactions among program design, learner characteristics, guidance, practice opportunities, and the conditions in which performance is expected (Suhaimy et al., 2023). In vocational ICT education, students may encounter programming, networking, databases, web development, hardware, and emerging technologies, yet their ability to use this knowledge also depends on instructional time, teacher preparation, practical materials, laboratory conditions, and opportunities for practice and feedback. Similar implementation challenges occur across low- and middle-income country TVET systems, where curriculum reform may outpace institutional capacity, teaching resources, and workplace connections (World Bank et al., 2023).

Assessment is central because it influences what learners are expected to demonstrate and what certification can communicate. Competence-based and authentic assessment approaches emphasize practical tasks, products, explanation, observation, and reflection alongside written knowledge assessment (Baartman et al., 2007; Gulikers et al., 2006). Assessment may nevertheless favor predictable and administratively manageable forms of performance, particularly where teaching time, practical resources, or assessment capacity are limited. Students may therefore progress by reproducing

familiar procedures without being required to diagnose unfamiliar problems, explain technical choices, or adapt knowledge to changing situations.

Qualifications remain valuable. Credentials can certify program completion, support progression, organize eligibility, and communicate educational history, but they do not necessarily provide complete evidence of performance in practical or unfamiliar settings (Bills, 2003). In technical recruitment, qualifications may consequently be considered alongside projects, practical tasks, explanations of previous work, and responses to feedback. Formal certification and practical evidence may therefore serve complementary functions.

Capability development also extends beyond formal program completion. Workplace-learning research shows that occupational competence develops through participation, interaction with experienced colleagues, feedback, problem-solving, and work experience (Billett, 2001; Eraut, 2004). For vocational ICT learners, continued development may also occur before employment through online tutorials, technical documentation, external courses, peers, projects, freelancing, and informal mentoring. Self-regulated learning is important in rapidly changing technical fields, but the capacity to organize and sustain such learning can itself depend on guidance, feedback, and educational support (Mejeh & Grieder, 2025).

This extended learning process should not be understood solely as individual responsibility. Employability is shaped by interactions among capability, personal circumstances, institutional opportunities, networks, labor-market conditions, and access to resources (Römgens et al., 2020). Graduates with similar qualifications may therefore experience different transitions because they differ in access to equipment, internet connectivity, technical English, mentors, project opportunities, mobility, time, and financial support. Skills-mismatch research identifies differences between educational provision and labor-market requirements (Brunello & Wruuck, 2021). The present study takes a related but narrower perspective by examining how usable vocational capability develops across formal education, additional learning, and participation at the education-work boundary, rather than treating transition primarily as a comparison between skills supplied by education and skills demanded by employers.

The boundary between education and work is an important site of both capability development and demonstration. Boundary-crossing research highlights how differences between settings can create discontinuity as well as opportunities for coordination and learning (Akkerman & Bakker, 2011). In VET, industrial attachments, work-integrated learning, employer projects, portfolios, and apprenticeship arrangements can connect educational knowledge with occupational activity, but their value depends on substantive participation, feedback, and links with prior learning. Evidence from

vocational placements in Uganda similarly emphasizes learner preparation, workplace participation, supervision, guidance, and coordination between education providers and workplaces (Jjuuko et al., 2021). Research on vocational ICT and work-integrated learning likewise suggests that industry contact is most useful when it provides practical participation rather than exposure alone (Armatas & Papadopoulos, 2013). The education-work transition can therefore expose discontinuities in prior learning while creating opportunities to extend capability through participation, feedback, and unfamiliar occupational demands.

Bangladesh provides a relevant setting in which to examine how vocational capability develops across education and work. Research has identified challenges concerning access to VET, institutional differentiation, labor-market connections, and pathways into work (Maurer et al., 2023). Bangladesh-focused research has examined VET graduate employment, future skills, teacher capacity, program provision, and industry expectations (Alam et al., 2024), while comparative research including Bangladesh has examined how industry-relevant training programs are shaped by institutional and provider arrangements (Maurer et al., 2025). Together, this literature highlights the importance of institutional capacity, teaching conditions, provider arrangements, and workplace connections in understanding how vocational education relates to subsequent participation in work.

Vocational ICT education makes these issues especially visible because formal programs must introduce broad and rapidly changing technical domains, while entry-level technology work may require depth in a narrower area, familiarity with particular tools and production practices, independent learning, and the ability to apply knowledge in less predictable situations. The transition from vocational education into work can therefore expose discontinuities between prescribed curriculum and classroom enactment, between assessment and unfamiliar problem-solving, and between formal certification and the forms of practical evidence encountered during recruitment and early workplace participation.

This study examines this problem through 20 semi-structured interviews with 13 vocational ICT graduates and advanced students, four instructors and lab trainers, and three technology hiring managers or technical founders in Bangladesh. It focuses on how practical capability was described as developing across formal vocational education, additional learning, industrial attachment, recruitment, and early workplace participation. Graduate and instructor accounts provide the principal evidence about learning, assessment, certification, and transition experiences, while hiring-side accounts are used more narrowly to contextualize how capability was interpreted during recruitment and workplace entry.

The study is guided by the following research question:

**How do vocational ICT graduates, advanced students, and instructors describe the development of practical capability across the transition from vocational education to entry-level technology work in Bangladesh?**

This study contributes to research on vocational ICT education and education-to-work transitions by examining practical capability as developing across, rather than solely within, formal vocational education. Through a bounded qualitative account of vocational ICT transitions in Bangladesh, it shows how curriculum enactment shapes opportunities to develop capability, how assessment influences what becomes visible and what certification can communicate, and how additional learning, industrial attachment, recruitment, and early workplace participation can extend and further demonstrate capability across the education-work boundary.

## Materials and methods

This study used qualitative interviews to examine how vocational ICT graduates, advanced students, instructors, and hiring-side participants described the development of practical capability across the transition from education to entry-level technology work in Bangladesh.

### Participants and recruitment

The dataset comprised 20 adult participants: 13 vocational ICT graduates and advanced students, four vocational instructors and lab trainers, and three technology hiring managers or technical founders. The graduate and advanced-student participants had completed or were approaching completion of diploma-level study in computer technology or a related vocational ICT program. The instructors and lab trainers had experience teaching or supporting practical learning in technical institutes, while the hiring-side participants had experience recruiting, evaluating, onboarding, or supervising entry-level technology workers.

Participants were recruited through contact-based and referral sampling based on their direct experience of vocational ICT education, practical training, recruitment, or entry-level technology work. Graduate and instructor accounts formed the principal evidence base, while hiring-side accounts were used more narrowly to contextualize recruitment and early workplace participation. Participants are identified as G1–G13 for graduates and advanced students, I1–I4 for instructors, and H1–H3 for hiring-side participants.

### Data collection

All interviews were conducted online using semi-structured interview guides adapted to the three participant groups. Interviews lasted approximately 45 to 90 minutes and addressed vocational learning,

practical work, assessment, certification, industrial attachment, additional learning, recruitment, and early workplace experience.

Interviews were conducted in conversational Bengali, with technical English terms used where relevant. Verbal informed consent was obtained before participation and audio recording. The interviews were audio-recorded and transcribed.

Selected quotations were translated into English for reporting, with technical English terms retained where participants used them. Minor repetition and speech fillers were removed for readability without changing the substantive meaning.

**Data analysis**

The analysis was thematic and combined attention to the areas addressed in the interviews with patterns emerging from participants' accounts. Interview transcripts were reviewed and annotated, and a structured codebook was developed to organize recurring topics, relevant excerpts, participant-group patterns, and contrasting accounts. A synthesis document was then prepared from the coded material to support comparison within and across the three participant groups. Both authors contributed to reviewing the interview material and refining the thematic structure.

The analysis initially focused on curriculum delivery, practical teaching, assessment, certification, additional learning, industrial attachment, recruitment, and workplace participation. Recurring patterns and meaningful differences were then examined within and across participant groups.

Graduate and advanced-student accounts were considered alongside instructor accounts where they addressed related educational experiences. Hiring-side accounts were used more narrowly to contextualize how capability was interpreted during recruitment and early workplace participation.

Attention was also given to accounts that complicated or contrasted with recurring patterns. These included descriptions of useful formal learning, project-based assessment, successful employment pathways, and hiring-side accounts that did not identify a consistent weakness specific to diploma graduates.

Related patterns were grouped into four themes. The themes were refined by revisiting the coded material and relevant interview excerpts, comparing supporting and contrasting accounts, and checking that each theme reflected the different evidentiary roles of the participant groups.

### Ethical considerations

All participants were adults. Interviews were conducted online. Before each interview, participants were asked to provide verbal informed consent for participation, audio recording, and the use of anonymized quotations and findings in research reporting. Only individuals who provided verbal informed consent were interviewed. Participation was voluntary.

Participant names are not reported. Identifiable institutional and organizational details were omitted where their inclusion could increase the risk of identification. Full interview transcripts are not publicly available because they contain contextual information that could compromise participant confidentiality.

The study did not receive prospective formal ethics approval because no formal institutional ethics review mechanism was available to the researchers at the time of data collection.

## Results

Participants described practical capability as developing unevenly across formal instruction, assessment, additional learning, industrial attachment, recruitment, and early workplace participation. Graduate and advanced-student accounts formed the main evidence base, while instructor accounts clarified teaching and institutional conditions. Hiring-side accounts were used more narrowly to examine how capability was interpreted during recruitment and workplace entry.

Four related themes traced different parts of this development. The first concerned the conditions through which curricular content became, or did not become, usable practical capability. The second concerned how assessment and certification made some aspects of capability visible while providing incomplete evidence of others. The third showed how capability continued to develop through learning beyond the formal program. The fourth examined how industrial attachment, recruitment, and early workplace participation both made capability visible under different expectations and provided further opportunities for development.

### Uneven pathways from curriculum content to practical capability

Accounts differed on the currency of vocational ICT curricula. Some graduates described outdated or overly basic content, while instructors referred to curriculum updates and newly introduced areas such as artificial intelligence and the Internet of Things. Across these accounts, the broader concern was whether curricular content was supported by sufficient teaching time, instructor preparation, practical materials, and laboratory resources.

Some graduates described programs that covered many technical areas without allowing sustained practice in any one of them. G1 explained:

> In some semesters, we had three programming languages. A semester gave us three or four months, and examinations took up much of that time. That left perhaps 40 or 50 days. How could someone learn a programming language properly in that time? (G1, graduate, government polytechnic)

Participants described programming, networking, hardware, graphics, databases, and general subjects being taught within the same program. For some learners, this breadth created introductory exposure but limited opportunities to develop confidence in technical problem-solving or specialization.

The quality of practical teaching also varied. Some graduates described instructors who could explain theory but had difficulty demonstrating procedures or troubleshooting student work. Others identified capable instructors and useful formal learning, indicating variation across teachers and institutions. Some graduates also distinguished between being shown a completed procedure and being taught how to approach a problem. They described instruction that presented prepared code or fixed steps without modeling how to construct a solution, diagnose errors, or revise an approach.

Instructor accounts connected these difficulties to the implementation of curriculum change. I1 stated:

> The curriculum is updated, but suitable books written at an expert level are not available. The practical sections of the books that are available are often very weak. (I1, instructor)

I1 also described newly introduced areas such as artificial intelligence and the Internet of Things as requiring specialized teacher preparation and appropriately equipped laboratories.

For some participants, language affected access to technical knowledge. One graduate described difficulty learning programming and networking through Bengali because the terminology and many learning resources were in English. Other accounts emphasized the importance of English for technical learning and professional communication.

Formal education nevertheless provided useful foundations in some cases. G6 described the diploma as important for progression into university:

> The first useful thing was the diploma because it allowed me to enter university. I studied many of the same subjects again in the bachelor’s program, but with more advanced material. (G6, graduate, government polytechnic)

Some instructors also described structured laboratory assignments, projects, and questioning through which students were expected to explain their work.

Curriculum currency and breadth therefore varied across accounts, but a broader issue was whether institutions provided the conditions needed to convert curricular exposure into practical capability.

**Assessment and certification as partial evidence of capability**

Participants attributed several functions to vocational certification. The diploma marked program completion, supported further education, provided a recognized educational identity, and could satisfy formal eligibility requirements. Several graduates nevertheless distinguished these functions from evidence of what they could do in unfamiliar technical situations.

Some graduates described assessment practices shaped by predictable questions, short semesters, and the need to complete many subjects. Memorizing code or reproducing familiar procedures could therefore become effective ways to pass examinations.

G2 described completing the program without confidence in independently constructing a simple program:

> After completing four years of the diploma, I could not write a program to add the numbers from one to ten. That was my failure because I had not learned it properly, but there should also have been someone to guide me and point out where I was going wrong. (G2, graduate, government polytechnic)

The same participant explained:

> I memorized four or five programs and wrote them in the examination. I followed the same approach later with C++, Java, and object-oriented programming. I passed, but I did not understand why programming was needed or how it would be useful afterwards. (G2, graduate, government polytechnic)

G2 acknowledged personal responsibility while also describing limited guidance and correction. This account illustrates how learner effort, guidance, and opportunities for correction could become intertwined.

Instructor evidence provided a contrasting account. I2 described a project-based assessment process:

> We assign projects to students. Even when a project is completed in a group, each student has to complete an individual component. We question them about what they did and what they

> learned. On that basis, we judge how much capability they have developed for practical work. (I2, instructor)

I2 also reported that some students had received job confirmation while still studying, although this was not verified through institutional records.

Graduates differed in how they valued the diploma. Some treated it as an important foundation or route into further education. Others viewed it mainly as a formal credential and attributed their directly usable technical skills to external courses, independent projects, or workplace learning.

Certification therefore functioned as partial rather than complete evidence of capability. Its practical meaning depended on how learning had been delivered and what students had been required to demonstrate.

**Capability development beyond the formal program**

Graduate accounts showed that capability development frequently continued alongside and after formal study. Participants described learning through external courses, online tutorials, technical documentation, peers, informal mentoring, independent projects, freelancing, further education, and employment.

This continued learning was not described only as compensation for weaknesses in formal education. Participants also recognized that ICT work requires ongoing learning because technologies and production practices change. The more important difference concerned how much foundation formal education had provided before learners had to organize additional learning themselves.

G1 attributed directly usable skills mainly to external learning:

> My job came from the experience I gained through the course. When I think about the courses I completed and what I learned from YouTube, the work I do now comes from those sources. The diploma mainly gave me the papers and the identity of a diploma engineer. (G1, graduate, government polytechnic)

For G1, an external course completed around the period of industrial attachment provided an entry into web development. Other participants described learning particular technologies through videos, documentation, coding resources, senior peers, and project work.

Participants also distinguished between reproducing tutorials and learning how to solve problems. Some described understanding technical work more deeply through failed attempts, feedback, technical

interviews, mentoring, and exposure to project structures that differed from individually completed tutorial exercises.

Access to these opportunities varied. Some participants had prior technical experience, mentors, peers, or exposure to real projects. Others reached the end of their program with limited understanding of occupational pathways or the additional preparation needed for employment.

Material conditions also affected continued learning. G1 described moving to Dhaka to pursue software work:

> To work in software, I had to move to Dhaka. Then there was the difficulty of finding accommodation as a bachelor, managing rent, food, and personal expenses, and attending interviews in different places. That was a major struggle. (G1, graduate, government polytechnic)

G1 also experienced the theft of laptops from shared accommodation, which interrupted access to equipment. Although this was an individual case, it illustrates how mobility, equipment, finance, and stability could affect a graduate's ability to continue learning and search for work.

Participants who entered employment described capability continuing to develop through unfamiliar assignments, documentation, senior colleagues, supervision, and feedback. Formal education could therefore provide a foundation, but capability was often extended across several learning environments.

**Capability at the education-work boundary**

Job seeking made some expectations visible that participants felt had not been fully apparent during study. These included problem-solving, requirement analysis, explaining previous work, communicating during difficulty, responding to feedback, and adapting to unfamiliar tasks.

G7 described a gap between basic programming instruction and the demands encountered during employment entry:

> The program helped us learn the basics of programming, but for entering a job there was a gap in industry-specific areas, such as how to solve problems and analyze requirements. If those areas had been included, I could have learned them more easily. (G7, graduate, private polytechnic)

Other graduates described differences between tutorial-based projects and organizational work involving shared code, established conventions, deadlines, and less predictable requirements.

The hiring-side interviews offered different perspectives rather than a single employer position. H1 emphasized adaptability, response to feedback, communication, persistence, and evidence of previous work:

> First, I look at how adaptive someone is when given a brief, how they react to feedback, and how they communicate with the team when they face a problem. (H1, hiring-side participant)

H1 also considered proof of previous work relevant when evaluating candidates from both diploma and computer science backgrounds.

H2 placed greater emphasis on individual variation and did not identify a consistent weakness specific to diploma graduates. H2 described vocational graduates who performed comparably to, or better than, bachelor's graduates when they had relevant experience and sustained practical engagement. H3 emphasized technical reasoning and understanding how systems worked, but described this as a concern across computing graduates more broadly.

These accounts suggest that formal qualifications were considered alongside more situated evidence, including previous work, reasoning through tasks, communication, and response to feedback. They do not establish a uniform employer-defined standard or a diploma-specific deficit.

Industrial attachment represented a potential bridge between education and work, but participants described substantial variation in its quality. I1 stated:

> If a student enters industrial attachment with about half of the necessary preparation already in place, the remaining development can happen during the attachment. Students who begin from zero often need another six months or a year before they reach that level. (I1, instructor)

This was I1's professional assessment rather than a measured estimate. Other participants described attachments involving limited technical participation, intermittent instruction, or training that produced marks or certificates without substantial workplace experience.

More useful attachments were described as those in which learners entered with some prior foundation, participated in authentic tasks, received guidance and feedback, and produced practical work. Workplace learning then continued after recruitment through assignments, supervision, resources, and interaction with experienced colleagues.

Across the four themes, practical capability was described as developing across interconnected learning and transition settings rather than being completed within formal vocational education alone. Curriculum enactment shaped opportunities to apply technical knowledge, while assessment influenced

what forms of capability were required and made visible within the program. Additional learning extended capability through projects, external resources, peers, and other learning opportunities. Industrial attachment, recruitment, and early workplace participation then exposed learners to different forms of task performance, explanation, feedback, and occupational participation through which capability could be demonstrated and further developed. Across these settings, accounts of stronger transitions emphasized opportunities to practice, solve unfamiliar problems, receive feedback, and produce credible evidence of work, while weaker transitions were associated with limited practical delivery, assessment based on reproduction, and workplace exposure with little substantive participation. Certification remained relevant, but its practical meaning depended partly on the learning and evidence that accompanied it.

## Discussion

This study examined how participants described the development of practical capability across vocational ICT education and the transition into entry-level technology work in Bangladesh. The findings suggest that capability was not experienced as an automatic consequence of curricular exposure, assessment, or program completion. Instead, it developed across interconnected educational and occupational settings in which opportunities to practice, demonstrate, extend, and refine capability differed.

These relationships should not be understood as a fixed sequence. Participants moved among formal study, external learning, projects, workplace exposure, and employment in different ways. The broader analytical point is that practical capability was described as developing across the education-work boundary rather than being completed within formal education and subsequently transferred unchanged into employment.

### Capability depends on curriculum enactment

Participants differed in their assessments of curriculum currency. Some graduates described outdated or overly basic content, while instructors referred to updated subjects and newly introduced areas. These contrasting accounts suggest that curriculum relevance cannot be assessed from prescribed content alone. The more consequential issue was whether institutions provided the teaching time, instructor preparation, practical materials, laboratory conditions, guidance, and repeated application through which curricular content could become usable vocational capability.

This distinction is consistent with vocational competence research that defines competence as the integration of knowledge, skills, judgment, and action within occupational situations (Baartman et al., 2007; Winther & Achtenhagen, 2009). Encountering technical content within a syllabus is therefore

different from being able to interpret requirements, construct solutions, diagnose errors, or explain technical decisions. The relationship between curriculum and capability is mediated by the conditions under which learners engage with that content.

In this study, compressed teaching periods, uneven instructor preparation, limited practical materials, and laboratory constraints were described as restricting opportunities for repeated and increasingly independent performance. Conversely, participants also described instructors, laboratory assignments, projects, and educational pathways that provided useful foundations, indicating variation in curriculum enactment rather than a uniform failure of vocational ICT education.

Adding or updating technical subjects may therefore increase formal curriculum relevance without necessarily strengthening practical capability if implementation capacity does not develop alongside prescribed content. Research on VET curriculum updates similarly indicates that implementation matters for graduates' skills and labor-market outcomes (Buehler et al., 2024), while studies in low- and middle-income settings identify teaching capacity, resources, and institutional coordination as constraints on TVET reform (Shimu & Haolader, 2025; World Bank et al., 2023).

The findings therefore shift attention from a simple distinction between current and outdated curricula toward the conditions of curriculum enactment. In vocational ICT education, practical capability depends not only on what enters the curriculum but on whether learners have opportunities to use, explain, troubleshoot, and extend that knowledge.

**Assessment shapes what certification can communicate**

Participants treated vocational certification as valuable, but not as complete evidence of practical capability. The diploma supported progression, recognition, educational identity, and formal eligibility, while its capacity to communicate practical capability depended on what learners had been required to demonstrate during the program.

Assessment therefore sits at the center of the relationship between learning and certification. Where students are required to construct, diagnose, explain, revise, and defend technical work, assessment can generate evidence of applied competence. Where progression depends mainly on predictable questions or reproduction of familiar procedures, certification may communicate less about performance in unfamiliar technical situations.

This interpretation is consistent with authentic and competence-based assessment research, which emphasizes practical tasks, products, observation, explanation, and reflection as complementary sources of evidence (Baartman et al., 2007; Gulikers et al., 2006). In this study, graduate accounts of memorization and reproduction contrasted with instructor descriptions of project-based assessment

requiring individual contribution and explanation, suggesting variation in what assessment practices made visible rather than a uniform regime.

Certification therefore inherits some of the strengths and limitations of the assessment processes through which it is awarded. Credentials can communicate program completion and educational attainment, but they cannot be assumed to represent all dimensions of practical performance (Bills, 2003). This helps explain why participants described qualifications as being considered alongside projects, previous work, technical explanation, problem-solving, and responses to feedback during transition into employment.

The issue is therefore not whether certification is valuable, but what kinds of capability the assessment system allows it to communicate. Strengthening the practical meaning of qualifications requires assessment arrangements that make application, reasoning, individual contribution, adaptation, and response to feedback more visible within formal vocational education.

**Capability develops across distributed learning environments**

Participants described practical capability as continuing to develop across formal education, external courses, online resources, peers, independent projects, further study, industrial attachment, and employment. These settings contributed different forms of knowledge, practice, guidance, feedback, and occupational exposure, supporting an understanding of capability as developing across distributed learning environments rather than within a single institutional setting.

This pattern is consistent with workplace-learning research, which conceptualizes occupational development as emerging through participation in activities, interaction with others, and engagement with the opportunities available in particular settings (Billett, 2001; Eraut, 2004). In vocational ICT, such development may begin before workplace entry because technologies, tools, and production practices continue to change during and after formal study. Continued learning should therefore be understood as a normal feature of technical work rather than, by itself, as evidence that vocational education has failed.

The findings nevertheless distinguish between extending an existing foundation and having to construct foundational practical capability largely outside the formal program. Some participants used external learning to deepen capabilities established through formal education, while others attributed directly usable technical skills mainly to external courses, projects, online resources, or workplace learning. The difference concerns the foundation from which learners enter continued development.

This process also cannot be reduced to individual motivation or self-direction. Self-regulated learning is important in rapidly changing technical fields, but it can itself be supported through guidance,

feedback, and instructional design (Mejeh & Grieder, 2025). In this study, access to equipment, internet connectivity, technical English, mentors, project opportunities, mobility, time, and financial resources shaped opportunities for further learning.

This distributional dimension is consistent with relational approaches to employability, which locate occupational transition within interactions among capabilities, resources, opportunities, networks, and institutional conditions (Römgens et al., 2020). Learners with similar qualifications may therefore face different transition demands because they do not have equal access to the conditions through which capability can be extended and demonstrated.

Ongoing learning and formal vocational education should therefore not be treated as alternatives. ICT occupations require continued development, but formal programs still shape the starting point from which that development occurs and can support learners in continuing to learn through projects, feedback, problem-solving, and engagement with changing technical resources.

**The education-work boundary makes capability visible**

Industrial attachment, recruitment, and early workplace participation exposed participants to expectations not always fully represented within formal education. Graduates described interpreting requirements, discussing previous projects, solving unfamiliar problems, communicating during difficulty, responding to feedback, and adapting to less predictable technical work. These settings therefore made aspects of practical capability visible under conditions different from classroom instruction and formal assessment.

The limited hiring-side evidence should not be interpreted as establishing general employer preferences across Bangladesh's ICT sector. Within the settings described, however, formal qualifications were considered alongside project evidence, technical reasoning, communication, adaptability, and response to feedback. The hiring-side accounts also did not establish a consistent performance hierarchy between diploma and bachelor's graduates.

Boundary-crossing research helps explain why these differences matter. Educational and workplace settings organize activity through different tools, expectations, forms of participation, and standards of performance (Akkerman & Bakker, 2011). Movement between them can expose discontinuities in prior learning while also creating opportunities to recontextualize and extend what has already been learned. The education-work boundary is therefore both an evaluative and developmental setting.

Participants' accounts of industrial attachment illustrate this dual role. Attachments appeared more useful when learners entered with some practical foundation, participated in substantive tasks, received guidance and feedback, and could relate workplace activity to prior learning. They appeared less useful

when participation was peripheral or completion was represented mainly through marks or certificates. Research on vocational placements similarly emphasizes preparation, substantive participation, supervision, guidance, coordination, and feedback (Jjuuko et al., 2021; Karkkulainen et al., 2026), while Guest's (2026) study of Australian apprenticeships highlights variation between more expansive and restrictive workplace learning arrangements.

This distinction separates workplace contact from workplace learning. Industrial visits, attachments, or employer partnerships may increase contact without necessarily producing meaningful capability development. Work-integrated learning becomes educationally significant when learners participate in relevant activities and receive feedback within occupational practice (Armatas & Papadopoulos, 2013).

Recruitment and early employment extended this process. Technical interviews, project discussions, unfamiliar assignments, supervision, and workplace feedback could expose limitations in prior preparation while also creating opportunities for further learning. Entry-level preparation should therefore not be understood as complete independence at the point of employment, but as having a sufficient foundation to participate, respond to guidance, and continue developing through work.

The education-work boundary thus makes prior capability visible under occupationally relevant conditions while also creating opportunities for further development. Its educational value depends less on contact alone than on the quality of participation, feedback, and engagement with unfamiliar tasks.

**Implications and scope**

The findings suggest that strengthening vocational ICT education requires attention to the conditions through which curricular content becomes usable capability, rather than curriculum revision alone. Introducing or updating technical subjects should therefore be accompanied by attention to teacher preparation, practical materials, laboratory resources, and opportunities for repeated application and feedback.

Assessment could place greater emphasis on creating, modifying, diagnosing, explaining, and revising technical work. Projects may be particularly useful where individual contribution is visible and learners are required to explain decisions and respond to feedback, strengthening the connection between assessment and the capability that certification communicates.

Industrial attachment should likewise be considered in terms of the quality of participation rather than completion alone. The accounts suggest greater educational value where learners enter with some practical foundation, participate in substantive tasks, receive supervision and feedback, and connect workplace activity with prior learning.

Transition support could begin before program completion through opportunities to understand occupational pathways, develop and explain project work, encounter technical interview practices, and become familiar with workplace expectations. Such support can connect formal education with the additional learning and workplace participation through which capability continues to develop.

These implications should be interpreted within the study's scope. The 20 interviews do not establish the prevalence of particular teaching practices, institutional conditions, assessment arrangements, or employment outcomes across Bangladesh. The study relies on participant accounts rather than direct observation and does not establish causal or temporal relationships among the conditions identified. Graduate and instructor accounts provide the principal evidence, while the three hiring-side interviews offer contextual evidence only.

The contribution is therefore a bounded qualitative explanation of how participants described practical capability developing across formal vocational education, assessment, additional learning, and participation at the education-work boundary.

## Conclusion

This study examined how participants described practical capability developing across vocational ICT education and the transition into entry-level technology work in Bangladesh. The findings suggest that capability was not experienced as something completed within formal vocational education and then transferred unchanged into employment. Instead, it developed across curriculum enactment, assessment, additional learning, industrial attachment, recruitment, and early workplace participation.

The study contributes to research on vocational ICT education and education-to-work transitions by showing how these settings perform different but connected functions. Curriculum enactment shapes opportunities to apply vocational knowledge, assessment influences what becomes visible and what certification can communicate, additional learning extends capability, and participation at the education-work boundary both reveals and further develops it.

This interpretation does not diminish the value of formal vocational education or certification. Formal education can establish important foundations, while qualifications support recognition, progression, and eligibility. Continued learning in ICT should also not be treated simply as compensation for inadequate education, since ongoing development is inherent in a rapidly changing technical field.

Because the study is based on a small qualitative sample and participant accounts rather than direct observation, the findings are not representative of vocational institutions or technology employers

across Bangladesh. The contribution is instead a bounded explanation of how practical capability was experienced as developing across interconnected educational and occupational settings.

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The authors report there are no competing interests to declare.

## Declaration of generative AI use

OpenAI ChatGPT was used to assist with language editing, manuscript organization, and refinement of the presentation of arguments. The authors reviewed the AI-assisted suggestions and take full responsibility for the final manuscript. No raw interview transcripts or direct participant identifiers were entered into the tool.

## Data availability statement

The interview transcripts are not publicly available because they contain contextual information that could compromise participant confidentiality. Anonymized quotations supporting the analysis are included in the article.

## References

Akkerman, S. F., & Bakker, A. (2011). Boundary crossing and boundary objects. *Review of Educational Research*, *81*(2), 132–169. https://doi.org/10.3102/0034654311404435

Alam, M. J., Reza, S. M. A., Ogawa, K., & Ahsan, A. H. M. (2024). Sustainable employment for vocational education and training graduates: The case of future skills matching in Bangladesh. *International Journal of Training Research*, *22*(3), 266–288. https://doi.org/10.1080/14480220.2024.2308224

Armatas, C., & Papadopoulos, T. (2013). Approaches to work-integrated learning and engaging industry in vocational ICT courses: Evaluation of an Australian pilot program. *International Journal of Training Research*, *11*(1), 56–68. https://doi.org/10.5172/ijtr.2013.11.1.56

Baartman, L. K. J., Bastiaens, T. J., Kirschner, P. A., & van der Vleuten, C. P. M. (2007). Evaluating assessment quality in competence-based education: A qualitative comparison of two frameworks. *Educational Research Review*, *2*(2), 114–129. https://doi.org/10.1016/j.edurev.2007.06.001

Billett, S. (2001). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning*, *13*(5), 209–214. https://doi.org/10.1108/EUM0000000005548

Bills, D. B. (2003). Credentials, signals, and screens: Explaining the relationship between schooling and job assignment. *Review of Educational Research*, *73*(4), 441–469. https://doi.org/10.3102/00346543073004441

Brunello, G., & Wruuck, P. (2021). Skill shortages and skill mismatch: A review of the literature. *Journal of Economic Surveys*, *35*(4), 1145–1167. https://doi.org/10.1111/joes.12424

Buehler, A. F., Lehnert, P., & Backes-Gellner, U. (2024). Curriculum updates in vocational education and changes in graduates' skills and wages. *Journal of Education and Work*, *37*(5–6), 458–482. https://doi.org/10.1080/13639080.2025.2456844

Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education*, *26*(2), 247–273. https://doi.org/10.1080/158037042000225245

Guest, W. (2026). Apprenticeship curriculum in the workplace: Examining expansive vocational education and training (VET) in the Australian food trades apprenticeships. *International Journal of Training Research*, *24*(1), 1–13. https://doi.org/10.1080/14480220.2025.2483196

Gulikers, J., Bastiaens, T., & Kirschner, P. (2006). Authentic assessment, student and teacher perceptions: The practical value of the five-dimensional framework. *Journal of Vocational Education & Training*, *58*(3), 337–357. https://doi.org/10.1080/13636820600955443

Jjuuko, R., Tukundane, C., & Zeelen, J. (2021). Reclaiming the educative power of vocational placements: Experiences from agriculture education practice in Uganda. *International Journal of Training and Development*, *25*(2), 144–159. https://doi.org/10.1111/ijtd.12212

Karkkulainen, E. A., Pihlainen, K., & Kärnä, E. (2026). Exploring work-based learning feedback experiences among students with learning difficulties in vocational education and training in Finland. *International Journal of Training Research*, *24*(2), 162–181. https://doi.org/10.1080/14480220.2025.2552699

Lecours, A., Laribi, S., Laliberté, M., & Kiki, G. M. (2026). Mapping transversal competences for vocational education learners in response to transformations in the world of work: A scoping review. *Education + Training*, *68*(3), 323–340. https://doi.org/10.1108/ET-08-2025-0678

Maurer, M., Haolader, F. A., & Shimu, S. S. (2023). VET for all: Assessing the case of Bangladesh. *International Journal of Educational Development*, *101*, 102819. https://doi.org/10.1016/j.ijedudev.2023.102819

Maurer, M., Shimu, S. S., & Veung, N. (2025). The emergence of training programmes for the garment industry: Analysing the cases of Bangladesh, Cambodia and Sri Lanka from a historical-institutionalist perspective. *International Journal of Training and Development*, *29*(1), 56–73. https://doi.org/10.1111/ijtd.12340

Mejeh, M., & Grieder, C. (2025). Educational interventions to promote self-regulated learning in vocational schools: A systematic review. *International Journal for Research in Vocational Education and Training*, *12*(2), 192–235. https://doi.org/10.13152/IJRVET.12.2.3

Römgens, I., Scoupe, R., & Beausaert, S. (2020). Unraveling the concept of employability, bringing together research on employability in higher education and the workplace. *Studies in Higher Education*, *45*(12), 2588–2603. https://doi.org/10.1080/03075079.2019.1623770

Shimu, S. S., & Haolader, F. A. (2025). TVET is under-resourced and held in low regard? Teachers' perceptions of TVET in Bangladesh. *Education + Training*, *67*(3), 419–435. https://doi.org/10.1108/ET-12-2023-0551

Suhaimy, M. H., Sumardi, W. A., Sumardi, W. H., & Anshari, M. (2023). An empirical study of training transfer in an apprenticeship programme for conducive workforce. *International Journal of Training Research*, *21*(2), 134–166. https://doi.org/10.1080/14480220.2022.2152471

Winther, E., & Achtenhagen, F. (2009). Measurement of vocational competencies — a contribution to an international large-scale assessment on vocational education and training. *Empirical Research in Vocational Education and Training*, *1*(1), 85–108. https://doi.org/10.1007/BF03546481

World Bank, UNESCO, & International Labour Organization. (2023). *Building better formal TVET systems: Principles and practice in low- and middle-income countries*. World Bank. https://hdl.handle.net/10986/40072