

Bootcamps for Work Competency Development: A Cross-Domain Scoping Review through an Educational Management Lens

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ABSTRACT

Intensive bootcamp programmes are used in medical, technological and academic training, yet evidence about them is scattered across domain-specific literature. This review maps how bootcamps are defined, for whom and why they are used, how they are designed and what outcomes are reported, and interprets these patterns through an educational management lens. A scoping review following Arksey and O'Malley's framework and JBI guidance, reported according to PRISMA-ScR. Scopus was searched once, through the Watase application, on 7 February 2024 (titles, abstracts and keywords; English-language journal articles, 2019 to early 2024); reliance on this single database is a key limitation. After screening and re-application of clarified eligibility criteria, 61 studies were charted and analysed through descriptive numerical summary and thematic synthesis, with management implications labelled as interpretive. Health professions education dominated the corpus (42 of 61 studies, 68.9%), and most bootcamps were embedded in formal education or training pathways (48, 78.7%); only four studies examined bootcamps as alternatives to formal education. Forty studies (65.6%) targeted participants at a role transition. Hands-on practice or simulation was the most frequently reported design feature (41, 67.2%). Evidence came mainly from single-group pre-post and descriptive studies; eight studies used a comparison group and 11 measured behaviour or results, with mixed findings. The review makes two distinct contributions: a cross-domain map of bootcamp provision that earlier single-specialty reviews do not provide, and an operationalised educational management reading (purposes, people and resources, processes, and institutional context) that frames bootcamps as transition-focused programmes whose evaluation remains underdeveloped. Implications for Indonesia are presented as policy options that require local evidence.

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Introduction

Indonesia's higher education system faces a dual challenge of access and relevance. The gross enrolment ratio for higher education stood at 32.89 per cent in 2025, according to Statistics Indonesia (BPS) data cited by the House of Representatives (DPR RI, 2026), and national planning documents acknowledge that industry and the world of work consistently report a mismatch between graduate competencies and industry needs (Badan Perencanaan Pembangunan Nasional [Bappenas], 2021). The same action plan records the SDG indicator on relevant skills for employment as not yet measured (Bappenas, 2021). Limited access and uncertain relevance together put pressure on SDG Targets 4.3 and 4.4, which call for affordable, quality tertiary and vocational education and for a substantial increase in skills for work and entrepreneurship (United Nations General Assembly, 2015).

Short, intensive and competency-oriented training has expanded alongside formal education. The Kartu Prakerja programme had reached 18.9 million recipients by October 2024 through more than 540 training institutions and over 6,000 training programmes (Tirto.id, 2024), and the government's Digital Talent Scholarship had trained more than 500,000 participants since 2018 (ANTARA News, 2024). These figures show demand for short-cycle provision, but they do not measure bootcamps as such. Indonesia has no national data on the scale, providers or outcomes of bootcamp programmes, and peer-reviewed Indonesian evaluations are rare; one recent study examined data-literacy boot camps for high school students through post-intervention surveys and a focus group (Kaur et al., 2025). Whether bootcamps form a significant layer of Indonesian provision is therefore an open empirical question rather than an established pattern.

Internationally, bootcamps are short programmes organised around intensive practice, simulation, feedback and collaboration, and they occupy markedly different institutional positions. In medicine, boot camps are usually embedded in formal training at the transition from medical school to residency (Blackmore et al., 2014; Neylan et al., 2017). In computing, coding bootcamps operate largely outside degree programmes and serve career changers seeking entry into digital work (Huang et al., 2026; Lyon & Green, 2021). Bootcamps can therefore be embedded, complementary or alternative forms of provision, and their relationship to formal education needs to be examined rather than assumed.

Existing reviews mirror this fragmentation. A supplementary search of PubMed (described in the Methods) identified eight reviews whose object was educational boot camps, all confined to medical or surgical education: a meta-analysis of postgraduate medical boot camps (Blackmore et al., 2014); systematic reviews of boot camps for surgical interns (Singh et al., 2015), for medical students entering surgery (Neylan et al., 2017) and of surgical simulation bootcamps (Young et al., 2022); reviews in otolaryngology

and urology (Bondzi-Simpson et al., 2022; Fu et al., 2023; Yeh et al., 2017); and a review of short ENT courses for junior doctors (Al-Khafaji et al., 2025). Outside medicine, a recent scoping review mapped 28 studies of coding bootcamps (Huang et al., 2026). Each review is bounded by a single domain, and none examines bootcamps as a managed educational programme across domains.

Two distinct gaps follow. The first is empirical: no cross-domain map shows how bootcamps are defined, positioned and designed across fields, or how strong the evidence about them is. The second is interpretive: reviews in educational leadership and management continue to leave topical gaps (Bellibaş & Gümüş, 2019; Mertkan & Gümüş, 2026), and bootcamps, which require explicit choices about objectives, participants, facilitators, assessment and partnerships, have not been read through an educational management framework. This review addresses each gap separately, so that its contribution does not depend on being the first review of bootcamps, which it is not.

Bush (2020) treats educational management as the organisation of purposes, resources and processes within institutions so that learning can occur, and compares management models by how goals are set, how structures and people are organised, and how organisations relate to their external environment. We operationalise this lens as four analytical dimensions used to code and interpret the charted evidence: (1) *purposes*, the objectives and target competencies of a bootcamp; (2) *people and resources*, including participants, facilitators and infrastructure; (3) *processes*, the design of learning and assessment; and (4) *institutional context and external relations*, including where the programme sits relative to formal education, who its partners are and how its outcomes are recognised.

This scoping review maps bootcamps used for work competency development and interprets the mapped evidence through these four dimensions. It asks: (1) How are bootcamps defined and characterised in the literature? (2) What functions and objectives do they serve? (3) In which fields, institutional positions and participant groups are they implemented? (4) How are learning processes designed and how are outcomes evaluated? (5) What management and policy considerations can be derived from these patterns, and where is the evidence insufficient to support them? Questions 1 to 4 are answered descriptively from the included studies. Question 5 is interpretive and is answered through the procedure set out in the Methods. The findings are relevant to policymakers, higher education institutions and training providers in Indonesia and comparable systems that are deciding whether and how to recognise, host or regulate short intensive programmes.

Methods

1. Review design

We conducted a scoping review because the aim was to map a heterogeneous body of evidence and its gaps, not to estimate the effect of bootcamps (Munn et al., 2018). The review followed the framework of Arksey and O'Malley (2005), with the refinements proposed by Levac et al. (2010) and the JBI guidance for scoping reviews (Peters et al., 2020), and it is reported according to the PRISMA extension for scoping reviews (PRISMA-ScR; Tricco et al., 2018). PRISMA-ScR governs reporting only; the methodological choices are those of the framework above. Consistent with scoping methodology, included studies were not critically appraised. Instead, the study design and the highest level of outcome reported were charted for every study, so that the strength of the evidence behind each pattern is visible to readers. No review protocol was registered.

2. Information source and search strategy

Scopus was searched on 7 February 2024 through Watase, an application that queries the Scopus database and was used here to run the queries, apply the filters and retrieve record metadata. Two search groups were run on titles, abstracts and keywords (Table 1). Group 1 retrieved records containing bootcamp or boot camp. Group 2 combined these terms with concepts, management or process to gauge how much of the literature describes bootcamps in managerial or process terms. Filters restricted records to English-language journal research articles published from 2019 to 2024 in Scopus-indexed journals ranked Q1 to Q4 and carrying an abstract. Record-level exports were not retained, so the overlap between the two groups could not be quantified retrospectively.

Table 1. Search strings, fields and filters (Scopus via Watase, 7 February 2024)

Group	Search string (field: TITLE-ABS-KEY)	Records	Purpose
1	TITLE-ABS-KEY (bootcamp OR "boot camp")	477	All bootcamp literature
2	TITLE-ABS-KEY ((bootcamp AND concepts) OR (bootcamp AND management) OR (bootcamp AND process)), run again with "boot camp" in place of bootcamp	322	Managerial and process framing
Filters (both groups)	Publication years 2019 to 2024; English; document type journal research article (reviews, conference papers, books and book chapters excluded); journal ranked Q1 to Q4; abstract available		

Note: Every Group 2 record also satisfies the Group 1 string, so the groups overlap; the 799 records are a record count, not a count of unique records.

To check whether earlier reviews had covered the same ground, a supplementary search for existing reviews was run in PubMed on 6 October 2026 with the string (bootcamp[tiab] OR bootcamps[tiab] OR "boot camp"[tiab] OR "boot camps"[tiab]) AND

(review[pt] OR systematic review[pt] OR "systematic review"[tiab] OR "scoping review"[tiab] OR "meta-analysis"[tiab] OR "literature review"[tiab]). Of the 56 records retrieved, eight were reviews whose object was educational boot camps, and all eight concerned medical or surgical education. Additional searching of Semantic Scholar, which also indexes non-biomedical journals, identified one further scoping review of coding bootcamps (Huang et al., 2026). None of these reviews covered more than one domain or used an educational management framework.

3. Eligibility criteria

Eligibility was defined with the Population, Concept and Context framework recommended for scoping reviews (Peters et al., 2020). *Population*: learners, trainees or workers developing work-related, professional or academic competencies. *Concept*: a programme explicitly labelled a bootcamp or boot camp, delivered over a short period through intensive, structured learning activities. *Context*: any field, country or provider, inside or outside formal education. Eligible sources were journal articles reporting primary data on the design, delivery, participants or outcomes of an identifiable bootcamp. These included quantitative, qualitative and mixed-methods evaluations, cross-sectional surveys of bootcamp programmes, and programme descriptions that reported primary programme data. We excluded reviews of any type, study protocols without results, conference proceedings and proceedings summaries, programmes delivered to patients, caregivers or the general public as health or behaviour-change interventions, articles in which a bootcamp appeared only as peripheral context, and articles whose full text could not be obtained. The publication window was 2019 to 2026.

4. Selection of sources of evidence

Selection proceeded through four stages: filtering at identification, title and abstract screening, full-text retrieval, and full-text eligibility assessment. The two search groups were screened in parallel. Within-group duplicates were removed at the filtering stage, and the retained articles were checked for duplicates across groups by title and DOI. Titles and abstracts were screened by the first author, and uncertain records were discussed with the other authors until consensus was reached. Full texts were sought through institutional subscriptions and open-access sources; interlibrary loan and contact with authors were not attempted. In response to peer review, the eligibility criteria above were stated explicitly and re-applied by two reviewers to all 75 articles retained in the earlier analysis. This step excluded 14 articles, listed with reasons in Supplementary Table S2. Figure 1 reports the number of records at each stage.

5. Data charting

A charting form was developed from the research questions and the four analytical dimensions. It recorded bibliographic details, country, field, participant group, whether

participants were at a defined role transition, provision type, programme duration and delivery mode, programme function, reported design features, study design, and the outcomes measured. Outcomes were classified by the highest level reached in Kirkpatrick's model (reaction, learning, behaviour or results), with learning divided into self-reported and objectively assessed learning (Kirkpatrick & Kirkpatrick, 2006). Participants were classified as being in transition when the bootcamp was delivered at, or immediately before, a defined change of role: from study to clinical or professional practice, from student to intern or resident, from junior to senior responsibilities, at entry to a new programme, or during a career change into a new occupation. Provision was classified as *embedded* (part of, or attached to, a formal education or professional training pathway), *in-service* (continuing development for practising staff) or *alternative* (outside formal education and leading to entry into an occupation). Two reviewers charted each study independently and resolved disagreements through discussion; agreement statistics were not calculated. The charted data for all included studies are reported in Supplementary Table S1.

6. Synthesis

The synthesis had two components. First, charted variables were summarised as frequencies and percentages. Second, findings were synthesised thematically following Thomas and Harden (2008). Findings and programme descriptions were coded line by line, codes were grouped into descriptive themes, and the descriptive themes were then interpreted against the four analytical dimensions. The initial coding frame was deductive, derived from the research questions (what bootcamps are, why they are used, for whom, and how they are delivered); codes outside this frame were added inductively. Studies whose findings ran against a developing theme, such as studies reporting no difference between participants and non-participants, were retained and reported explicitly. Management and policy considerations (question 5) were derived only from descriptive themes supported by at least three studies, and they are labelled as interpretive wherever they appear. Claims made by the authors of included studies were kept separate from our own inferences. Word clouds generated in Watase from the identified records served only as a descriptive picture of the search corpus and played no part in generating themes.

Result and Discussion

1. Selection of sources of evidence

The two search groups identified 799 records (Group 1: 477; Group 2: 322). Because every Group 2 record also satisfies the Group 1 string, the groups overlap, and 799 is a record count rather than a count of unique records. Filtering removed 492 records (289 and 203), leaving 307 for title and abstract screening, at which 194 were excluded (95 and 99). Of the 113 reports sought, 38 (33.6%) could not be retrieved (27 and 11). The 75

articles assessed in full contained no duplicates across groups. Re-applying the clarified eligibility criteria excluded 14 of them: three reviews, one proceedings summary, one study protocol, eight programmes for patients, caregivers or the general public, and one article in which bootcamps were peripheral. Sixty-one studies were included (Figure 1; Supplementary Table S2). Nine of the 75 articles had been retained only through Group 2; given the nested search strings, this reflects the search structure and screening decisions rather than the state of the field.

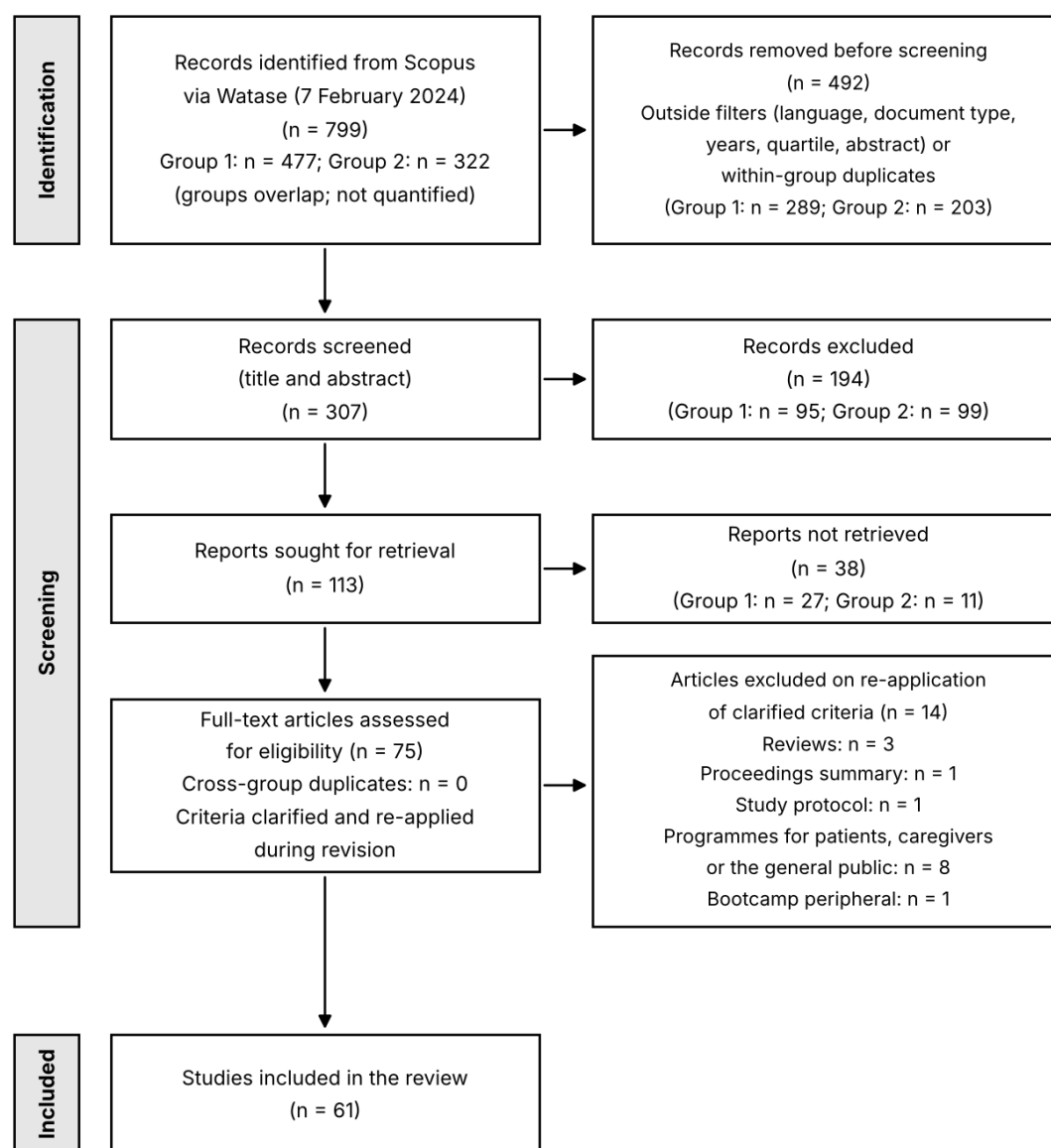


Figure 1. PRISMA-ScR flow diagram of source selection (adapted from the PRISMA 2020 template; Page et al., 2021)

2. Characteristics of the included studies

Table 2 summarizes the 61 studies. Between 9 and 14 studies were published each year from 2019 to 2023, with two from the first weeks of 2024. Fifty studies (82.0%) came from the United States (34), the United Kingdom (9) or Canada (7). Four came from Asia

(China, India and Malaysia) and one from Africa (Mauritius); none was conducted in Indonesia. Health professions education dominated: 36 studies (59.0%) concerned medicine and six (9.8%) other health professions (nursing, occupational therapy, pharmacy, veterinary medicine and interprofessional geriatric care), 42 studies (68.9%) in all. The 19 non-health studies (31.1%) covered computing (5), STEM and academic skills (5), academic and research development (5), entrepreneurship (2), industrial process safety (1) and the creative arts (1). Cross-domain patterns reported below are therefore weighted towards health professions education.

Most bootcamps were embedded in formal education or professional training pathways (48; 78.7%), typically in medical school, residency, fellowship or university programmes. Nine (14.8%) served practising staff as in-service development. Only four (6.6%) operated as alternatives to formal education: three studies of coding or programming bootcamps for career changers (Cunha et al., 2022; Lyon & Green, 2020, 2021) and one entrepreneurship bootcamp (Hasan & Koning, 2019). Single-group pre-post designs were the most common (26; 42.6%), followed by descriptive programme reports (10; 16.4%), comparative designs (8; 13.1%), cross-sectional or post-only surveys (6; 9.8%), mixed-methods studies (6; 9.8%) and qualitative studies (5; 8.2%). Twenty-six studies (42.6%) reported outcomes no higher than reaction or self-reported learning, 17 (27.9%) assessed knowledge or skill objectively, 11 (18.0%) reached behaviour or results, and seven (11.5%) reported no learner outcomes.

Table 2. Characteristics of the included studies (n = 61)

Characteristic	Category	n (%)
Publication year	2019	14 (23.0)
	2020	12 (19.7)
	2021	10 (16.4)
	2022	14 (23.0)
	2023	9 (14.8)
	2024	2 (3.3)
Country	United States	34 (55.7)
	United Kingdom	9 (14.8)
	Canada	7 (11.5)
	Australia	2 (3.3)
	India	2 (3.3)
	Other (China, Ireland, Italy, Malaysia, Mauritius, Portugal, multi-country Europe)	7 (11.5)
Field	Medicine	36 (59.0)
	Other health professions	6 (9.8)
	Computing	5 (8.2)
	STEM and academic skills	5 (8.2)
	Academic and research development	5 (8.2)
	Entrepreneurship	2 (3.3)

Characteristic	Category	n (%)
	Other (industrial process safety, creative arts)	2 (3.3)
Provision type	Embedded in a formal pathway	48 (78.7)
	In-service (practising staff)	9 (14.8)
	Alternative to formal education	4 (6.6)
Participants at a role transition	Yes	40 (65.6)
	No	21 (34.4)
Programme function	Initial skill acquisition	36 (59.0)
	Advanced competency development	25 (41.0)
Duration	1 day or less	9 (14.8)
	2 to 7 days	11 (18.0)
	8 days to 1 month	8 (13.1)
	More than 1 month (continuous)	2 (3.3)
	Spaced multi-session	7 (11.5)
	Not reported or variable	24 (39.3)
Delivery mode	Face-to-face	54 (88.5)
	Virtual	6 (9.8)
	Blended	1 (1.6)
Study design	Single-group pre-post	26 (42.6)
	Descriptive programme report	10 (16.4)
	Comparative (comparison group)	8 (13.1)
	Cross-sectional or post-only survey	6 (9.8)
	Mixed methods	6 (9.8)
	Qualitative	5 (8.2)
Highest outcome level	Reaction	2 (3.3)
	Self-reported learning	24 (39.3)
	Objectively assessed learning	17 (27.9)
	Behaviour	5 (8.2)
	Results	6 (9.8)
	No learner outcome reported	7 (11.5)

3. Definitions and characteristics (question 1)

Studies defined bootcamps operationally rather than conceptually. The shared elements were brevity, intensity and an emphasis on doing: 41 studies (67.2%) described hands-on practice, simulation, laboratory work or project work as a core activity. Duration ranged from a two-hour session (Lee-Riddle et al., 2021) to a six-month programme followed by a nine-month internship (Cunha et al., 2022). Among the 37 studies that reported duration clearly, programmes of one week or less predominated (20 studies). Duration was missing or varied across sites in 24 studies, which prevents any conclusion about how short a programme must be to count as a bootcamp. Several medical studies

tied the label to timing rather than length, describing bootcamps as courses held at the start of a new clinical role (Blackmore et al., 2019; Walker et al., 2020).

4. Functions and objectives (question 2)

Thirty-six studies (59.0%) used bootcamps for initial skill acquisition, preparing participants to enter a role or field (e.g., Bevilacqua et al., 2020; Graves et al., 2020; Lyon & Green, 2020). Twenty-five (41.0%) used them for advanced development of participants who already had a relevant background (e.g., Bender et al., 2021; Koenig et al., 2023; D. V. Smith et al., 2020). Function overlapped with timing: 26 of the 36 initial-acquisition studies involved participants at a role transition.

5. Fields, institutional positions and participants (question 3)

Role transition was the most consistent participant feature. Forty studies (65.6%) delivered the bootcamp at, or immediately before, a change of role. Most concerned the move from medical school to internship or residency (e.g., Lewis et al., 2021; Nakazato et al., 2019; Zhang et al., 2022), but the same pattern appeared at entry to doctoral study (Clune et al., 2023), at the move to senior resident responsibilities (Lee-Riddle et al., 2021) and during career change into computing (Cunha et al., 2022; Lyon & Green, 2020, 2021). Thirty-five of the 40 transition-focused studies concerned embedded provision. Medical and computing bootcamps differed in institutional position. Medical bootcamps were run by schools, hospitals or specialty bodies inside accredited training pathways, and one national urology course was eventually recommended to all new trainees in the United Kingdom (Kozan et al., 2023; Please & Biyani, 2022). The coding bootcamps for career changers operated outside degree programmes and were judged by entry into computing jobs (Lyon & Green, 2020, 2021). Most non-health academic bootcamps served university students or academic staff (e.g., Botham et al., 2020; Clune et al., 2023; Rowtho et al., 2020).

6. Learning processes and outcomes (question 4)

Besides hands-on practice, studies reported didactic or case-based instruction (27; 44.3%), peer collaboration or teamwork (19; 31.1%), facilitation by experts or near-peers (12; 19.7%), structured feedback or assessment for learning (10; 16.4%) and explicit links to the labour market or workplace (5; 8.2%). These counts reflect what studies reported explicitly. Feedback and facilitation are probably under-reported, because many articles described content rather than pedagogy. Near-peer facilitation by senior residents was described in several medical studies (Elliott et al., 2022; Khan & Bakhiet, 2022; Ramadan et al., 2023), and structured peer and faculty feedback was the central design element of a grant-writing bootcamp (Botham et al., 2020).

Evidence was strongest for short-term, self-reported change. Most pre-post studies reported gains in confidence or self-efficacy, and 17 studies reported objectively

assessed gains in knowledge or skill, for example in surgical skills (Bevilacqua et al., 2020; Kassam et al., 2021) and wheelchair-skills capacity (Giesbrecht, 2024; E. M. Smith et al., 2020). The eight comparative studies produced mixed results. Participants outperformed comparison groups on grant funding (Botham et al., 2020), on primary-care practice indicators and patients' use of emergency and inpatient services (Bender et al., 2021), and on later course grades (Applebee et al., 2021), and the students of teachers trained in a two-month bootcamp achieved higher grades than students taught conventionally (Singhal et al., 2021). A five-day compressed laboratory course produced outcomes comparable with its semester-long equivalent (Ardisson et al., 2019). An emergency-medicine bootcamp raised confidence but not programme directors' ratings (Lewis et al., 2021); peer effects in an entrepreneurship bootcamp depended on participants' prior ties (Hasan & Koning, 2019); and a study across 17 programmes found no educationally significant association between paediatric bootcamp participation and early intern performance (Rideout et al., 2022).

7. Thematic synthesis

Table 3 links the descriptive themes to the four analytical dimensions. For each theme it shows the number of supporting studies, representative examples and the predominant evidence. The last column is the authors' interpretive synthesis and should not be read as a finding of the included studies.

Table 3. Descriptive themes, supporting evidence and interpretive reading by analytical dimension

Dimension	Descriptive theme (evidence)	Studies (n) and examples	Predominant evidence	Interpretive reading (authors' synthesis)
Purposes	Bootcamps target a bounded set of competencies needed for an imminent role; delivery is timed at a role transition	40; e.g., Nakazato et al. (2019), Lewis et al. (2021), Clune et al. (2023), Lyon and Green (2021)	Pre-post; self-reported and objective learning	Objectives are set by the demands of the next role, so analysing that role is a core management task
People and resources	Programmes depend on facilitators, often near-peers, and on simulation or laboratory resources; programme surveys report faculty time, funding and faculty experience as barriers	12 reporting facilitation; e.g., Elliott et al. (2022), Ramadan et al. (2023); programme surveys: Kumar et al. (2019), Dean et al. (2019)	Qualitative, pre-post, cross-sectional	Facilitator time and expertise are scarce resources to be planned and funded; the evidence does not identify facilitator qualifications linked to better outcomes
Processes	Hands-on practice dominates and is often paired with peer collaboration and feedback; few studies compare design variants	41 practice, 19 collaboration, 10 feedback; e.g., Botham et al. (2020), Peddle and Austerberry (2024)	Pre-post; few comparisons	Coherence between objectives, practice and assessment is a plausible management focus, but which elements matter most has not been tested

Dimension	Descriptive theme (evidence)	Studies (n) and examples	Predominant evidence	Interpretive reading (authors' synthesis)
Institutional context and external relations	Most bootcamps are embedded in formal pathways; alternative bootcamps are judged by labour-market entry; outcome evaluation rarely reaches behaviour or results	48 embedded, 9 in-service, 4 alternative; 11 with behaviour or results outcomes; e.g., Lyon and Green (2021), Rideout et al. (2022)	Mixed; comparative designs rare	Governance, recognition and evaluation depend on provision type; claims that bootcamps substitute for formal education rest on a very small evidence base

8. Bootcamps as transition-focused programmes

The clearest cross-domain regularity is timing. Across medicine, the health professions, doctoral education and computing, bootcamps cluster at the point where people move into a new role. Surgical reviews have identified delivery at transition as a core component of bootcamp design (Young et al., 2022), and postgraduate medical boot camps were originally defined as courses for learners entering new clinical roles (Blackmore et al., 2014). The present map shows that this pattern is not specific to medicine: it also appears at entry to doctoral study (Clune et al., 2023) and in career change into computing (Lyon & Green, 2020, 2021). Read through Bush's (2020) dimensions, this suggests that the object being managed in a bootcamp is a transition, not simply a block of content.

We state the contribution to educational management as three propositions for testing rather than as established findings. First, in short-cycle programmes the purposes are set by the demands of the receiving role rather than by the sending institution, so needs analysis has to involve the receiving setting, such as supervisors or employers. Second, managerial logic depends on provision type: embedded bootcamps inherit governance, quality assurance and assessment from their host pathway, whereas alternative bootcamps must build legitimacy through labour-market signals and employer recognition (Huang et al., 2026; Lyon & Green, 2021; Mulas et al., 2017). Third, evaluation is the least developed management function: 26 of the 61 studies stopped at reaction or self-reported learning, only 11 reached behaviour or results, and where comparative evidence exists the effects are inconsistent. These propositions do not modify Bush's models. They specify how his dimensions apply to a programme type that compresses goal setting, resourcing and evaluation into a short cycle.

The map also corrects two claims that are often made for bootcamps. Outcomes beyond technical skill, such as self-efficacy, communication and teamwork, were reported in several studies (Botham et al., 2020; Durk et al., 2020; E. M. Smith et al., 2020), but mostly through self-report. And only one included study compared a bootcamp format directly with an equivalent formal course; it found comparable grades and learning gains (Ardisson et al., 2019). The evidence therefore does not support the claim that bootcamps achieve broader or more efficient outcomes than formal programmes.

9. Comparison with previous reviews

The evidence profile outside medicine resembles that reported within it. Blackmore et al. (2014) found large pre-post gains in postgraduate medical boot camps but noted that pre-post designs limit the strength of that conclusion; Neylan et al. (2017) found no objective data showing that medical school boot camps improve performance in internship; and Al-Khafaji et al. (2025) found that nine of eleven studies of short ENT courses used single-group pre-post designs. Huang et al. (2026) likewise called for longitudinal evidence on the employment outcomes of coding bootcamps. Null findings from comparative studies, both in this corpus (Rideout et al., 2022) and among doctoral students in an earlier multi-institution study (Feldon et al., 2017), caution against equating participant satisfaction with effectiveness.

10. Policy options for Indonesia

None of the included studies was conducted in Indonesia, and most of the evidence concerns embedded medical programmes. The following are therefore policy options to be tested, not recommendations derived from Indonesian evidence. Indonesia already has several channels through which bootcamp outcomes could be recognised. The national qualifications framework (KKNI) was established to align and equate the outcomes of education, job training and work experience (Peraturan Presiden Nomor 8 Tahun 2012). The National Education System Law allows outcomes of non-formal education, including courses and training, to be recognised as equivalent to formal education after an equivalence assessment against national standards (Undang-Undang Nomor 20 Tahun 2003, Article 26). The Manpower Law and its implementing regulation provide for competency certification through the National Professional Certification Agency, BNSP (Undang-Undang Nomor 13 Tahun 2003, Article 18; Peraturan Pemerintah Nomor 10 Tahun 2018). Higher education institutions can also recognise prior learning from non-formal and informal settings and from work experience as academic credit (Permendikbudristek Nomor 41 Tahun 2021).

Four options follow, each requiring feasibility studies and local evidence. First, bootcamp outcomes could be recognised through these existing channels, by competency certification against national occupational standards or by prior-learning credit, rather than through a new credential category; whether bootcamp curricula map onto these standards and KKNI levels has not been examined. Second, higher education and vocational institutions could pilot embedded bootcamps at transition points, such as before internships, clinical placements or first employment, where the international evidence is most consistent; pilots should include comparison groups. Third, publicly funded short-course schemes that include bootcamp-style provision could require outcome reporting beyond satisfaction, including objective assessment and employment follow-up, so that evidence accumulates; even within medicine, programme directors are

divided on whether bootcamps should be standardised (Dean et al., 2019). Fourth, because the evidence identifies facilitator time and experience as constraints (Kumar et al., 2019) but does not identify qualification thresholds associated with better outcomes, policy is better directed at funding facilitator time and development than at prescribing mentor qualification standards. These options sit within the wider policy interest in short, stackable learning units such as micro-credentials (Gamage & Dehideniya, 2025; OECD, 2023).

11. Limitations

The review has several limitations that bear directly on its conclusions. The search used a single database, English-language journal articles and a filter for Q1 to Q4 journals, so grey literature, Indonesian-language studies and articles in unranked or non-Scopus journals were missed; programmes with bootcamp features but other names were also missed. The two search groups were nested and screened in parallel, their overlap could not be quantified because record exports were not retained, and the same record could have received different decisions in each group. Thirty-eight of the 113 reports sought (33.6%) could not be retrieved, and neither interlibrary loan nor author contact was attempted, which introduces availability bias. The eligibility criteria were stated explicitly and re-applied after peer review; the resulting exclusions are documented in Supplementary Table S2. Studies were not critically appraised, agreement between reviewers was not quantified, and design features were charted as reported, so features may be under-counted. Finally, the corpus is weighted towards health professions education and towards the United States, the United Kingdom and Canada, so transfer of these patterns to non-health fields and to Indonesia is a proposition rather than a finding.

12. Future research

Three lines of work would address the gaps identified. Comparative studies with follow-up into practice or employment are needed to test which design elements, such as feedback, facilitation or the timing of delivery, are associated with outcomes. Studies of alternative bootcamps, including those in Indonesia, should examine how employers and qualification bodies recognise bootcamp outcomes. And applying the four analytical dimensions prospectively, for example through multi-site studies of how bootcamp providers set objectives, select and develop facilitators, assess participants and build partnerships, would test whether the propositions stated above hold.

Conclusion

Across 61 studies published between 2019 and early 2024, bootcamps can be conceptualised as a recurring programme model: short, practice-intensive learning organised around the competencies needed for an imminent role. The model is concentrated in health professions education and is mostly embedded within formal pathways; only a handful of studies examined bootcamps as alternatives to formal

education. Hands-on practice, feedback, facilitation and peer collaboration recur across domains, but these are descriptive regularities. The evidence base, dominated by single-group pre-post and descriptive studies, does not establish which design features cause better outcomes, and comparative studies show mixed results.

Read through an educational management lens, bootcamps are transition-focused programmes whose purposes, resources, processes and institutional relations have to be managed deliberately, and whose evaluation is the least developed of these functions. For Indonesia, where no study in this corpus was conducted, recognising bootcamp outcomes through KKNI-referenced certification or prior-learning credit, hosting embedded bootcamps at transition points, and requiring evaluation beyond participant satisfaction are policy options that warrant feasibility studies and local evidence before adoption.

Declarations

Author contribution statement

Lina conceived and designed the study, developed the review framework, conducted the searches, made final eligibility decisions, led the synthesis and interpretation, and prepared the original manuscript. Rizqi Nur Afifah served as second reviewer for data charting and coding, checked the consistency of the extracted data, contributed to interpretation and critically revised the manuscript. Iqbal Faza Ahmad managed the literature and references, prepared the descriptive word-cloud visualisation of the search corpus and the figures, and critically revised the manuscript. All authors approved the final version and agree to be accountable for the work.

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Data availability statement

The charted data for all included studies and the list of articles excluded at re-screening are provided in the supplementary material.

Declaration of interests statement

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

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