

Medical Laboratory Science Education: Integrating Core-Skills Training into Clinical Internships

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Introduction

- Medical Laboratory Science (MLS) education traditionally emphasizes theoretical knowledge and technical skills.
- Clinical laboratory practice also requires communication, teamwork, adaptability, and professionalism.
- Lack of structured soft-skills training creates a gap between academia and clinical demands.
- This gap affects collaboration, reporting accuracy, and patient-care workflows.

Methodology

Study Design

- Four-year evaluation (2020–2024) of an academic internship preparation program accompanying the mandatory MLS clinical internship
- Internship duration: 3 months, conducted in accredited medical laboratories
- Program goal: support soft-skills development and clinical readiness

Participants

- 299 final-year MLS students, Jerusalem Multidisciplinary College, Israel (272 women, 27 men)
- 71 laboratory managers from diverse clinical departments

Thematic Analysis:

Data Collection

- Student reflections (pre/mid/post; guided → open prompts)
- Supervisor evaluations (mid/end; performance, integration, behavior)

Data Processing and Analysis

A Python-based pipeline (2021–2024 data) included:

- Pre-processing:** text cleaning for consistency
- Regex coding:** semantic lexicon capturing Hebrew roots and lab-specific terms
- Thematic mapping:** alignment to 5 student and 6 supervisor themes (Qizi framework)
- Hybrid analysis:** automated categorization (Python/Pandas, keyword matching) with expert refinement

Valence

- Facilitating | Hindering | Neutral

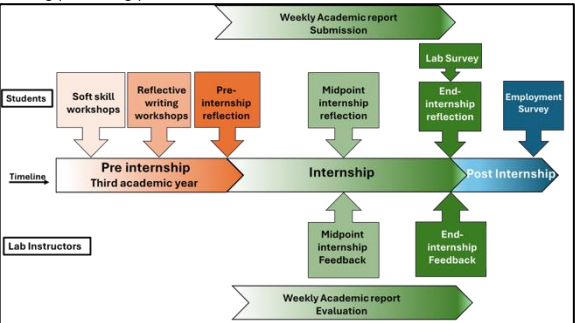


Figure 1: Schematics of Internship-Accompanying Academic Program

The academic program involved the following steps:

- Soft-skills workshops (teamwork, communication, time management, professional motivation).
- Reflective writing assignments: pre-, mid-, and post-internship.
- Weekly academic reports, designed with laboratory managers (Delphi method)
 - Laboratory workflow overview
 - Clinical case-based reporting
- Reports reviewed jointly by laboratory managers and academic internship director.

Results

Table 1: Thematic Analysis Overview mapping of supervisors' questionnaires (Qizi framework)

Qizi Domain and theme	Stage	n (Total)	Facilitating	Hindering	Neutral	Representative Quote
Personal domain Work Ethic & Responsibility	MID	73	67	6	0	"A serious worker, responsible, and has a good learning ability."
	END	81	76	5	0	"Can be trusted blindly... carries out tasks with great care."
Methodological domain Learning Capacity & Initiative	MID	72	66	6	0	"A serious intern who learns quickly and follows instructions. Also writes well."
	END	76	68	8	0	"Intern with a desire to learn, punctual, and shows interest. There is a language barrier but she is making progress."
Methodological domain Response to Feedback	MID	7	5	2	0	"Attentive to criticism and shows a trend of improvement."
	END	19	16	3	0	"Improved significantly after the first questionnaire; well done."
Methodological domain Professional Expertise	MID	41	35	6	0	"Pleasant, kind, responsible, and diligent. Shows relevant knowledge, performs tasks meticulously, and helps significantly."
	END	52	47	5	0	"Responsible, dedicated. Works very well in a team. Attentive to supervisors. Learns equipment and theoretical knowledge quickly."
Social domain Teamwork & Social Integration	MID	78	74	4	0	"Pleasant to the environment and integrates well with the staff."
	END	77	74	3	0	"Liked by the team and performed very well... integrated exceptionally."
Job Readiness & Potential	MID	8	7	1	0	"Everyone enjoys her presence. She is calm, proactive, learns quickly... I wish I could offer her a position."
	END	15	15	0	0	"I have no suggestions for improvement, only to continue gaining experience. Her work was excellent."

Thematic Analysis Overview The mapping into Qizi's (2020) three overarching domains was performed following the initial thematic analysis of the supervisors' evaluation questionnaires at mid and end internship stages (MID, END). This categorization facilitates a comparative look at the developmental progression of professional competencies.

Table 2: Thematic Analysis Overview mapping of students' questionnaires (Qizi framework)

Qizi Domain and theme	Stage	n (Total)	Facilitating	Hindering	Neutral	Representative Quote
Personal domain Emotional Intelligence & Resilience	PRE	167	50	117	0	"Slightly insecure due to the unknown and fear of success."
	MID	41	15	13	13	"Starting to feel more comfortable, but there is still pressure."
	END	43	21	8	14	"I dealt with the challenges... the pressure no longer scares me."
Personal domain Professionalism & Accountability	PRE	339	155	184	0	"The ability to arrive on time and perform all assigned tasks."
	MID	176	92	12	72	"I maintain order and organization at work and adhere to schedules."
	END	160	92	9	59	"I feel that I take full responsibility for the results I produce."
Cross-domain: Personal-Methodological Initiative & Proactive Engagement	PRE	126	92	34	0	"I want to show that I am diligent and contribute to the lab."
	MID	67	37	1	29	"Trying to offer help and take initiative even in small tasks."
	END	51	21	0	30	"Taking initiative and looking for where I can contribute."
Methodological domain Critical Thinking & Autonomy	PRE	201	140	61	0	"To understand the meaning of the test and why it is performed."
	MID	185	108	12	65	"Linking what I learned in college to professional life in the lab."
	END	184	97	10	77	"Understand the results and their clinical significance in depth."
Social domain Interpersonal & Communication	PRE	203	94	109	0	"I hope to integrate into the team and feel pleasant with people."
	MID	95	45	5	45	"The staff is nice and helping me learn and integrate into the work."
	END	97	49	2	46	"Establishing good professional and social relationships."
Other / General	PRE	70	0	34	36	"Distance of the lab from home / Being color blind."
	MID	9	0	0	9	"I hope the continuation will be as good as it was until now."
	END	16	0	0	16	"Everything is excellent and very good."

Thematic Analysis Overview The mapping into Qizi's (2020) three overarching domains was performed following the initial thematic analysis of the questionnaires completed by students at each internship stage (PRE, MID, END). This categorization facilitates a comparative look at the developmental progression of professional competencies.

Employment Survey: Post-internship, over half of graduates were employed in the MLS profession, and about one-third continued to work in the laboratory where they had trained (Fig. 3). Evaluation of reflective components showed that ~40% of interns rated the importance of laboratory instructor feedback as high (4–5 on a 5-point scale), whereas self-evaluation was rated as highly impactful by 68% of respondents.

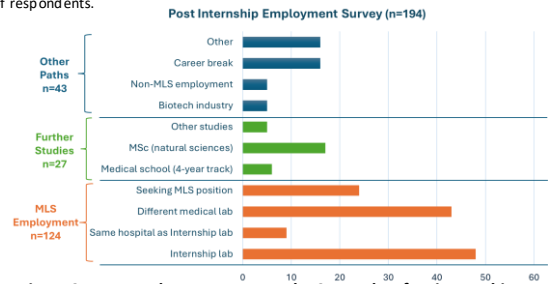


Figure 2: Post graduate survey results 2 months after internship

Conclusions

- Structured academic accompaniment fosters soft-skills development and professional identity during MLS internships.
- Mid-internship feedback + reflection are key levers for student growth.
- Supervisor evaluations:**
 - Predominantly **facilitating (positive)** supervisor evaluations across all domains.
 - Domains with Strongest emphasis:
- Methodological domain** (expertise, learning, feedback response).
- Work ethic and responsibility**
- Team integration and communication**
- Job readiness increased**
- Overall: strong supervisor confidence in students' professional competence
- Student Developmental Progression** was observed across the three domains:
- Personal:** from anxiety and insecurity → ownership and resilience
- Interpersonal:** from hierarchy concerns → integration and effective communication
- Methodological:** from conceptual seeking → confident clinical interpretation
- The model supports employment continuity and bridges academia–clinical practice.

References

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