

Needs Before Novelty: A Theoretical and Practical Framework for Curriculum Change in the Industry 5.0 Era

1. Rahat Rizvi, 2. Nazia Imam

1. Assistant Professor, Dept of Essential Studies, NED University

rahatbhatti@neduet.edu.pk

2. Lecturer, FAST, National University of Computer & Emerging Sciences, Karachi

nazia.imam@nu.edu.pk

Abstract

The concept of curriculum change is often interpreted as a 'new' curriculum, while the literature on curriculum theory has long held that a clear statement of need should be the basis for any curriculum change. This paper takes up the argument again at a time when the object of curricular need is changing. The paper summarises and concludes that, on the basis of the classical and contemporary theories of curriculum (Tyler, 1949; Taba, 1962; Walker, 2002; Gordon et al., 2019) and the needs-assessment tradition (Kaufman & English, 1979; Witkin & Altschuld, 1995; Altschuld & Watkins, 2014), needs assessment is not just a preliminary step to the development of a curriculum, but it is also a process that keeps theory responsive to practice. It then introduces this argument to the new discourse on Industry 5.0, which presents a different vision on the development of technology, moving from efficiency to human-centric, resilient and sustainable technologies (Nahavandi, 2019; Ivanov, 2023; Ghobakhloo et al., 2025). This provides an integrated, needs-based way to think about curriculum change, rather than a change in the skills that need to be taught in the syllabus, it would simply be a new definition of what would be considered a need. Implications are drawn for the higher education policy in developing countries

such as Pakistan where changes in the school curriculum do not match the changes in the labour market and society.

Keywords: Curriculum change, Needs assessment, Industry 5.0, Human-centric education, Higher education policy

1. Introduction

Fewer words in educational discourse carry as much baggage of meaning as does “curriculum” and as many areas of ambiguity in agreed meaning. Since that time a number of different definitions of curriculum have emerged, ranging from a narrow interpretation of curriculum as a list of subjects to a very broad one, as being the total of all the experiences, a learner has in the institution under the guidance of a particular leader (Print, 1993; Marsh, 2004). This conceptual flexibility is not only in housekeeping academic field. In practice, it is very important because different approaches to curriculum definition and evidence for the need for change in curriculum, who can authorize it, and what it should be like for a curriculum change to be satisfactory (Hull, 2007).

This paper asks a different, but no less pressing, question: What justifies curriculum change and what is it that needs to be rethought given the transition of economies to what a rising number of authors in the engineering, management and education field are calling Industry 5.0 (Nahavandi, 2019; Ivanov, 2023)? The theory that is used here is the ‘answer curriculum theory’ that has been put forward in the last seven decades, but in principle, it is still valid – although in need of a new application and new material. The answer needs assessment which is a systematic process to identify the difference between the current and desired state (Kaufman & Stakenas, 1981; Altschuld & Watkins, 2014). The principles of needs assessment are the same, it's just the criteria used for assessing “preferred.” Industry 4.0's logic of efficiency and automation will exclude those who are working in the future, who will have to deal with the challenges they will have to navigate, coordinate and interact with intelligent systems, make decisions based on their own judgment and be able to absorb shocks to the supply chains, to the labour markets, to ecosystems that the logic of efficiency, automation, of Industry 4.0, did not foresee (Ghobakhloo et al., 2025; Piccarozzi et al., 2024).

The paper makes 4 moves. In Section 2, the theoretical background of curriculum change is revisited, and the linear-rational models are compared with adaptive and naturalistic models. Section 3 looks at aspects of change that are more "real world" and looks at the interface between theory and institutional constraint. The theoretical models are held accountable and responsible by needs assessment as the fulcrum and also by keeping the practical process of reform from becoming a reactive tinkering process, as argued in Section 4. It is featured in the context of Industry 5.0 in Section 5 and future opportunities for integration are highlighted in Section 6, with specific implications for policy formulation for HE systems in which the focus on curriculum evaluation has been more calendar than need oriented such as Pakistan's.

2. Curriculum Change: Theoretical Background

There are two common types of theoretical literature on curriculum development: deductive and linear-prescriptive, and inductive and non-linear, descriptive (Gordon et al., 2019). The best-known of the latter is Ralph Tyler's rationale. Tyler's four questions of objectives, experiences, organisation and evaluation is related to the curriculum design process which can be made explicit and defended (Tyler, 1949; Siason, 2025). This analysis offered that objectives should be narrowed based on data concerning the learners, the social issues of the day, and the subject matter itself as well as further based on philosophical and psychological issues. That kind of model is transparent, and if it's transparent it can be cross-examined, meaning that the individual steps can be questioned. It is acknowledged that its 'strengths' are that it seeks to identify facts to collect in relation to its source-whereas it makes the assumption that its source is a fixed entity that can be fact-figured rather than a moving one that is constantly re-diagnosed.

Taba (1962) reply to this was to flip the order. Taba recommended that curriculum workers, particularly teachers, should first make a diagnosis of the needs of the learners in the local context, and then create pilot units of instruction before generalizing to a larger scheme of teaching (Taba, 1962). Her model, however, is grassroots and not top-down, and the first place where a needs diagnosis is made evident is the classroom, rather than the ministry or university senate. Walker (2002) suggested naturalistic model lies between the teaching of curriculum and a design, in that a set of beliefs serves as the basis for a design, but in this case, neither of the two steps is fixed in

terms of precedence. What Tyler, Taba, and Walker have in common, despite their differences of opinion about sequence and authority, is that they feel curriculum change can be justified only when it can be traced back to some condition, whether it is expressed as a societal goal, a learner deficiency, or a proposition which the planning group is willing to defend.

In recent times, however, other, more “modern” thinking has favoured ideas of change over time more than just one step. In his work on educational change, Fullan (2016) argues that curriculum reform as an iterative process, with the quality of the curriculum document being only a small part of the change process in the classroom, and sometimes not even a significant part. This movement has implications for the present discussion because it implies that a needs assessment done at the start of a reform cycle is insufficient. When curriculum change is iterative, so also must be needs assessment – it is not a one-shot diagnostic test but rather a process of monitoring.

3. A Pragmatic Approach to Curriculum Change

It is impossible, without any theoretical models, to explain why a curriculum should be thought of in this way, or to explain why so many well thought out curriculum designs fail to contribute to what happens in classrooms and lecture halls. Some of the most frequent implementation gaps found in the literature include a gap between a curriculum document and a curriculum that is actually put into practice. The teacher at the elementary and/or secondary level is not a neutral carrier of a preconceived curriculum but is one who interprets, adapts, and sometimes just challenges it according to his or her sense of what students need to learn and what conditions are permissible in his or her curriculum (Priestley et al., 2015). Technical, document-related aspects of curriculum change will tend to underestimate the scope of the change.

Three things appear to be crucial in the literature as to the success or failure of a curriculum change. The first is participation: involving practicing teachers (or faculty) not only in being told what needs to be done, but in actively discovering the need for change is more likely to foster a sense of ownership that will support implementation through inevitable bumps in its head during the next few years (Fullan, 2016; Priestley et al., 2015). The second is capacity, that is, a changed curriculum, with assumed competencies, equipment or class sizes that are not available at the school or university, will not pass the best theorizing. The third is alignment: the requirements for

the curriculum, assessment and accreditation have to be aligned; if one is changed without the other, the old requirements will make themselves known without a raised voice even if the written syllabus is different.

These are working conditions which should not be separate from the needs assessment process, but in a proper understanding are a part of what the needs assessment should identify before a design is finalized. A needs assessment that concludes that there is a need for a new skill in the workplace, but that faculty are not able to teach the new skill, or that the assessment system in place does not recognize and reward faculty ability to teach the new skill, has only identified half the problem. This is not a preliminary stage, but a continuous discipline which sees design informed by need and is achievable and sustainable.

4. Needs Assessment as the Initial Mechanism of Curriculum Change

In the USA, the formal entry of needs assessment into curriculum discourse was in the early 1960s, as part of a movement toward a systems approach to educational planning; since then, the definition, which varied slightly across authors, has been to specify and prioritise the gap between current and desired states (Kaufman & English, 1979; Kaufman & Stakenas, 1981). Two differences are prevalent in this literature and must be highlighted because they are often combined in practice. The first is to distinguish between the need and the want; the need is based on some kind of evidence between actual and desired condition, while the want is the stakeholder's preference (Witkin & Altschuld, 1995). The second is the difference between the learner level and the institution /society level; a difference which is real at the learner level is not necessarily real at the institution /society level and a defensible needs assessment must identify at which level a gap exists (Altschuld & Watkins, 2014).

This logic is empirically continued in contemporary use of needs assessment in curriculum design. In medical education, Raffing et al. (2023) have presented a staged process that starts with exploratory and qualitative needs assessment, then leads to more definitive and quantitative confirmation, before finalizing an actual course, and were able to demonstrate that course

development along this path resulted in significantly more population responsive courses than courses developed based on an assumed syllabus. All medical education is generalised – if the gap is to be closed, why not start with an evidence-based account of that gap?

The ageing challenge is actually more of a need to conduct a needs assessment, rather than less. The curriculum review cycle of 5-7 years that is regularly used in many public university curricula assumes that the object of the learner and the need of society remain fairly stable during the review cycle. This assumption, however, has been shaken to its core in recent changes of organization in industry, which are now considered.

5. Industry 5.0: Redefining the Object of Curricular Need

The intention of the curriculum reform was to make a change in the curriculum which would last for ten years, involving automation, data connectivity and cyber-physical systems. Many of the publications of the resulting "curriculum 4.0" literature were centred on the task of the curriculum reform: the incorporation of technical competences, coding, data analysis, robotics, in the existing programs (Barrot, 2023). While Industry 5.0 is not displacing the underpinning technology per se, it is shifting its focus of application. For its frequent occurrence, Nahavandi (2019) termed the fifth industrial revolution as the reboot of the human worker, claiming that people and smart machines will work together and not be replaced by automation. Ivanov (2023) has formalized this in a three-part guide that makes resilience, sustainability and human-centricity co-equal design criteria for industrial systems, rather than an add-on constraint at the end of the efficiency optimization. There is now a substantial body of literature that has confirmed this reframing, while some authors are still debating the extent to which this reframing has actually happened in practice, (Ghobakhloo et al., 2025; Piccarozzi et al., 2024).

The curricular implication is not just to add new technical content, there will be some of that, but not all of it. Rather, the standards for the determination of "need" need to be broadened. A needs assessment, which is based only on a list of technical skills employer's state that they are looking for, will result in an Industry 4.0 curriculum that has an Industry 5.0 label on it. The same point, from the supply side, is made by Barrot (2023) who argues that a really fifth industrial revolution

curriculum can only be constructed through a sustained, systematic process of interaction between institutions, the demand side (in this case the employer side), and skills bodies – not through a one-off consultation exercise – as this type of skill is not the one that a single survey instrument is likely to reliably surface. At the higher education level, recent instructional design efforts have explicitly attempted to meet this challenge by addressing the gap between the skills taught in the curriculum and the skills required by a human-centric and resilient industrial base through competency-based, multi-method needs assessment, which involved a literature review, employer surveys and a structured workshop (Arregi Lopez et al., 2026; Korte et al., 2024).

Based on this, three implications can be drawn for the design of a needs assessment if Industry 5.0 is used as a referent. **First** the informants need to be extended beyond the employers' expressed technical needs to include evidence of reorganization of work around human-machine collaboration that is happening on employers' shop floors and in their offices, but not yet voiced. **Second**, the sustainability /resilience must not be treated as an ethics course tacked on to the end of a technical program, but rather be seen as a learning outcome as it is treated in literature as a design criterion of equal importance as the human-centricity (Ivanov, 2023). **Third**, a needs assessment for Industry 5.0 can't be one-off; it must be an ongoing institutionalizing process and the fundamental paradigm of Industry 5.0 will remain a work in progress and is still subject to debate in the scholarly literature.

6. Toward an Integrated, Needs-Anchored Framework

Based on the above, the paper proposes a curriculum change for Industry 5.0 that consists of four phases of curriculum change, all of which target failures identified in the models presented above.

6.1. Diagnostic breadth

The needs assessment stage should not be based solely on employer surveys as Tyler (1949) suggested that it ought to be based on more than one source of objectives, and changed the focus of the sources.

6.2. Participatory design

Faculty and where possible, students, should be engaged with the diagnosis and interpretation (as discussed in the Taba (1962) grassroot approach and in the literature relating to implementation (as reviewed in Section 3) as this will help to ensure the change becomes embedded in the classroom (Priestley et al., 2015).

6.3. Structural alignment

The structure of the assessment, the standards to be met, and professional development of the staff all need to be changed in line with the curriculum document; an unchanged assessment system will reinforce the emphasis of any prior curriculum, no matter what the new curriculum syllabus states (Fullan, 2016).

6.4. Recurrent, not episodic, review

The needs assessment which started the cycle needs not to end the cycle since the industrial and technological referent is still in flux. An institutional needs assessment committee that meets periodically is less flexible with the logic of Industry 5.0 than a standing mechanism (Altschuld & Watkins, 2014; Ivanov, 2023).

7. Policy corollary: the HEC curriculum revision system in Pakistan

The Pakistani case is both a plus and a minus to the argument above: Pakistan does have a formal system of curriculum revision (as opposed to the ad hoc system), and it is based on law. The statutory body for the bachelor's level and above curriculum revision is the Higher Education Commission (HEC) which carries out this responsibility through the National Curriculum Revision Committees (NCRCs), each of which focuses on a specific discipline (HEC, n.d.-a). The NCRC process is very similar to a needs assessment cycle, in that a first draft of the NCRC is circulated to local and expatriate subject experts and also universities for comment; the universities' comments are discussed at a second NCRC meeting and a final NCRC is then notified as a mandatory minimum to all universities (HEC, n.d.-a). In addition, HEC agrees to review all subjects' curricula every 3 years (HEC) and any changes since 2023 will be made in accordance with the Undergraduate Education Policy (V 1.1) (HEC, 2026), developed in consultation with the

universities, and the Graduate Education Policy, which entered into effect from Fall 2023, in line with changes in the skill demands of the labour market (HEC, 2023a, 2023b; Aziz et al., 2023; Deboor, 2021; Noor et al., 2024; Saleem et al., 2021; Soomro et al., 2025; Zainal Abidin et al., 2017)).

It meets the structural-alignment and recurrent-review conditions reasonably well as per the framework set in Section 6: it has a three-year cycle as a recurrent one by design, and the requirement of the revised curriculum to align with the Undergraduate and Graduate Education Policies, and with the Pakistan Qualification Framework, is a form of cross-document alignment which Section 3 found to be a common problem area elsewhere. The least documented areas of the system are diagnostic breadth and participatory design at least in the curriculum documents that were made public and examined for this paper. The NCRC documents do not define a methodology for a needs assessment, nor an evidence-base based on employer or graduate outcome data, nor a means of capturing the reorganization of work around human machine collaboration as defined in Section 5. The multi-source diagnostic process proposed in this paper is a step towards replacing the more limited expert consultation that occurs in the NCRC process, but is not sufficient on its own.

This analysis leads to three additions to the existing HEC cycle that are not very disruptive. **First**, the terms of reference for each subject committee may stipulate that evidence supporting a review for a given subject (e.g. an employer survey, a graduate tracer study or a skills forecast) should be recorded of its findings; this would make a review process an auditable process as opposed to a discretionary one, but not introduce any greater level of bureaucracy (HEC, 2025). **Secondly**, a lighter standing mechanism within the university/faculty can be implemented on top of the three-year review cycle that monitors need between formal NCRC cycles (Buchan, 1991; Chen et al., 2025; Lock et al., 2018; Samuel & Farrer, 2025), following the recurrent-review logic of Section 6 and with the emphasis on resilience in the industry 5.0 literature (Ivanov, 2023). **Third**, since the subject of human-centricity and sustainability is not directly mentioned in the Undergraduate and Graduate Education Policies, it could be included in the Policy's evaluation criteria by the Human Capital Development Division, along with the existing technical-competency or Pakistan Qualification Framework evaluation criteria, to ensure that the evaluation committees are urged to consider these

dimensions while evaluating the policy, rather than relying on a technical-skills checklist that was transferred to them from the Industry 4.0 era (Akhund et al., 2025; Ali et al., 2024; Hansen, 2024; Janevska et al., 2025; Kopp & Schröd, 2024;).

8. Conclusion

Curriculum theory has never viewed curriculum change as an end goal; it must always have a justification for the change, such as explaining the gap to be bridged, and this is referred to as needs assessment. It's not this logic, it's the content of the logic: human-centric, resilient and sustainability criteria that now dictate industry and social needs require a broader diagnostic base, a more participative design process, a closer alignment of structure and, most of all, an ongoing assessment cycle, not just one-off. The curriculum planner who sees Industry 5.0 as a list of technical add-ons will develop a curriculum that is at best one revolution behind. But planners who consider it a what it was supposed to be "re-engineered" or "revived" are more likely to produce graduates who can collaborate with the systems, and uncertainties, that this new paradigm of industry is supposed to offer.

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