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National Qualifications Framework in Practice: Problematising an Initial Teacher Education (ITE) Curriculum from a Curriculum Ergonomics Perspective

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Abstract

Claimed by some to be a successful policy tool to connect education with the industrial world, a body of research has documented issues on adapting and adopting the National Qualifications Framework (NQF), a worldwide policy phenomenon. However, there are fewer studies on implementing this framework in initial teacher education (ITE). Therefore, to fill this gap, this paper explores and contextualises the enactment of NQF within the ITE sector from a curriculum ergonomics perspective, a novice concept of analysis on the interactions between curriculum design and its use. This paper contributes to the existing research on curriculum studies, especially in the ITE sector. Implications and recommendations are also discussed.

Keywords: Curriculum ergonomics; curriculum reform; Indonesia; initial teacher education; national qualifications framework

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1. Introduction

National qualifications frameworks (NQF) have been increasing rapidly since the mid-1990s, when the first frameworks were initially established in the following countries, Australia, England, New Zealand, Scotland, and South Africa. Earlier in the late 1990s and early 2000s, vocational frameworks were developed in the Caribbean, modelled on the competence-based training model underpinning the original British National Vocational Qualifications (Allais, 2016, 2017). Simultaneously, through the 'Bologna process, the notion of levels and learning outcomes was initiated to align higher education systems within Europe. The European Qualifications Framework, which the European Union adopted in 2008, fueled the most support for this policy process. Many countries then continue to develop frameworks: the European Training Foundation, Cedefop, and UNESCO (2019) argue that by 2019 more than 142 countries are developing frameworks, with a focus on labour market mobility.

The National Qualifications Framework (NQF) aims to strengthen 'relationships between education and training systems on one side, and labour markets on the other.' (Allais, 2011), aims at numerous educational reforms such as promoting the learning outcomes orientation and transparency of qualifications. Curriculum reforms are one of the consequences for regulating NQF as the standard for curriculum design. Higher education institutions that have been adapting/adopting this framework have happened to modify their curriculum (i.e., content, learning outcomes, educational approaches, education environment, assessment methods, and learning environment). This framework drives competence- and outcome-based curricula (Widodo & Allamnakhrah, 2020).

There have been attempts on how to translate the demands of NQF into the higher education curriculum. Since this framework was rooted in the vocational sector, a growing body of research was dominated by vocational studies, such as hospitality and tourism (Oktadiana & Chon, 2017), and archives vocational education (Mirmani & Surtikanti, 2018). Research on the implementation of NQF in other non-vocational sectors is still underutilised. To mention some of the available research was on public administration (Tamronglak, 2020), management (Mitrofanova et al., 2019), and business education (McGrath et al., 2019). Among other non-vocational sectors, initial teacher education (ITE) has not yet been discussed. Widodo and Allamnakhrah (2020) report a case study that examined the effects of a blended professional learning group (PLC) on teacher educators' changes in professional identity at initial teacher education (ITE) curriculum reform under the NQF program, which was adopted from international NQFs.

Considering the lack of research on the implementation of NQF in the ITE sector, this paper, therefore, takes curriculum ergonomics (CE) (Choppin et al., 2018) as its theoretical basis and aims to present several recommendations on the implementation of NQF in initial teacher education. It reveals the interactions of NQF as a curriculum reference, ITE curriculum designers as the users in the first level, and teacher-educators as the users in the

second level. Moreover, it proposes recommendations at institutional and policy levels regarding curriculum ergonomics that may help improve the implementation of NQF in higher education. The paper's contributions provide directions for framing the current higher education curriculum and giving fresh insight into ITE curriculum development, which considers agencies of teacher-educators and curriculum designers.

The article is composed as follows: the second section provides a brief overview of the literature related to the adaptation or adoption of NQF as a framework to connect education and work. Section three defines CE as the conceptual background of this study. The article then discusses the ITE curriculum from the perspective of CE. Section four discusses differences in qualifications, competence, skill, and capacity, focusing on ITE. The section that follows discusses the issues surrounding teacher educators' roles in curriculum design and implementation. Section six contextualises Indonesia's NQF-based ITE curriculum by providing a valuable graphic for better understanding. The final section makes recommendations for future research, policymakers, and stakeholders and some implications.

2. National Qualifications Framework in the Global Territory

Much of the current literature on the national qualification framework (NQF) pays particular attention to the enactment of NQF concerning the job market within several countries. Mikulec (2016) examines the NQF to increase employability and labour mobility in several countries in Europe (e.g., Denmark, Germany, Portugal, and Slovenia). Allais (2016) found out that the NQF is considered the framework qualification of labour market outcome in six countries (e.g., Belize, France, Ireland, Jamaica, Sri Lanka, and Tunisia), which gives a significant relationship between prerequisite and occupation. It implies that a competency-based curriculum national qualification framework (NQF) should meet the needs of learners' learning outcomes and workplace in a broadening way, as has been done in Mexico (de Anda, 2011), Malaysia (Marock, 2011), and Australia (Wheelahan, 2011).

The initiation of developing a qualification-based curriculum by several countries is making a closer link of vocational schools and high education levels to the labour market needs. Brown and Lauder (2013) found out that the framework's issue should be transferable across the nation to meet the employers' demands to potential employees in the economic globalisation era. That is the consequence of that era where the border across countries is invisible in job-seeking opportunities. Regarding the phenomenon, the term 'qualification' becomes the identity of the current curriculum approach worldwide, namely a National Qualification Framework (NQF).

Mexico was interested in the concept of learners' competencies, and qualifications as the national education policies emphasise labour competencies in upper-level technological education (de Anda, 2011). Furthermore, the NQF adapted in Malaysia was emphasised, according to (Marock, 2011) ‘strengthening the intrinsic logic and qualifications; the validity

of the knowledge and skills that they certify and the potential linkages between qualifications based upon shared or linked areas of knowledge and learning.' Supporting the implementation of NQF in Malaysia leads to standards and quality assurance by initiating Malaysia Quality Assurance (MQA). In Australia, the Australian Qualification Framework (AQF), established in 1995, created a flexible framework for all qualifications in 2010. This qualification framework has been changed into the Australian Ministerial Council for Tertiary Education and Employment (MCTEE). While there has been an extensive body of research on the enactment and implementation of qualifications frameworks, nationally or regionally, scholars pay little attention to this issue within Indonesia's context. This specific country enacts NQF to all fields within higher education, including ITE.

While there has been an extensive body of research on the enactment and implementation of qualifications frameworks, nationally or regionally, scholars pay little attention to this issue within Indonesia's context. This specific country enacts NQF to all fields within higher education, including ITE. NQF has dictated ITE programs in designing their curriculum. The stakeholders of these programs may have the authority to design the curriculum, but with the standards demanded by NQF, such as levelling system, learning outcomes, and graduate profiles. Among other countries which enact NQF, Indonesia's preference to regulate it to all fields of studies, particularly ITE, may be of interest to be investigated more.

3. Teacher educators' role within ITE curriculum design and use

Decisions about which level to place qualification are based entirely on an analysis of the competencies or learning outcomes comprising a particular qualification, mainly as these are supposed to be designed based on the descriptors' level. NQFs attempt to use outcomes rather than competence in a precise way, as providing a detailed and transparent description of occupational competencies while also providing an exact and transparent basis for the creation of learning programmes for all qualifications at all levels (Allais, 2011).qualifications at all levels (Allais, 2011). From NQF perspectives, 'Qualification' refers to an (employment) position. Meanwhile, competencies are abilities, skills, or potential understood as characteristics of individuals, teams, work units, or organisations. The main criterion for distinguishing qualifications and competencies assumes that qualifications are knowledge and skills that can be objectively described and are functional.

In contrast, the concept of competence encompasses many different aspects, referring to four types of competence and learning outcomes (knowledge, skills, social competence and self-competence). Bohlinger (2008, 2012) denoted by models and theories on developing, evaluating, assessing, and making visible use of a person's knowledge, competencies, and experiences. Knowledge is the body of facts, concepts, theories, and activities relevant to a field of study or work that results from the assimilation of information through learning. Skill refers to the ability to apply knowledge and use know-how to complete tasks and solve problems. At the same time, competence means the proven ability to use knowledge, skills,

personal, social and methodological abilities, work or study situations, and professional and personal development (Bohlinger, 2012).

4. Curriculum Ergonomics

The ergonomics of curriculum concept was rooted in cognitive ergonomics (Hollnagel, 1997), which emerged from classical ergonomics. It connects machines' design and the conditions in which they are more compatible with consumers' behaviour to use machines in a secure, more comfortable, and ultimately more productive way. Study in cognitive ergonomics points to the complexities of developing instruments. These processes facilitate decision-making in diverse and nuanced contexts, such as classrooms, and it explores cognitive load challenges as individuals participate in complex tasks, in this case, relating to the design and implementation of a curriculum.

Conceptualised by Choppin et al. (2018), curriculum ergonomics is a new field in curriculum studies that studies the interactions of curriculum design, its designers, its users, and its implementation. In curriculum ergonomics, curriculum design is separated from the designers and their intentions; curriculum use or implementation is separated from the users and their intentions. Curriculum ergonomics examines the interplay between curriculum design and use. Design refers to the features of education resources and how resources can be coordinated to plan instruction. The designers can be someone who designs resources for use by others, or it can be the teachers who coordinate the creation of resources for others and adapts or revises them for their purposes. We discuss designers as people distinct from the user and how some teachers started their projects. The curriculum includes the plans teachers make based on the curriculum resources they use. Resources refer to the range of materials that teachers use as they construct their lessons.

A curriculum ergonomics addresses five main themes outlined by Choppin et al. (2018) in the following Table 1 and will be further discussed in the next paragraphs.

Table 1. Five Curriculum Ergonomics Themes

Theme	Description
Teachers' relationship with and capacity to use curriculum resources	Design processes in which teachers engage as they draw from and transform curriculum resources.
Alignment between design intentions and patterns of curriculum use	How users' intentions and patterns of use align with the intended pattern of use envisioned by the designers
Ways in which curriculum resources influence instruction	How messages and structure in materials influence instructional outcomes from the use of the materials

Theme	Description
Ways in which curriculum features are purposefully designed to achieve a specific purpose (e.g., an educative purpose)	How features of the design in curriculum resources can push users to engage with content or the materials in new ways
Dissolution of boundaries between design and use	In the context of digital resources, teachers are engaging in new design practices as they participate collectively in the design of materials and select materials for lessons.

The first theme is the teacher's capacity to transform and implement curriculum resources into practice. It defines the instructor's design methodology as a planner, including the documentation approach and participatory perspectives. These perspectives emphasise the importance of teachers in interpreting, drawing from, and completely integrating curriculum tools. The documentation approach describes an iterative process in which teachers appropriate and transform curriculum resources. Gueudet and Trouche (2009) outline processes that distinguish between a resource's design and how it gets taken up and transformed by teachers. The documentation approach assumes that teachers' sets of resources, usage schemes, and capacity to transform resources constitute an essential form of professional growth.

The second theme is associated with teachers' usage of curriculum resources and the designers' intentions to use them. Due to various reasons linked to teachers' histories, backgrounds, skills, and variables in the educational context, the designer and student do not share the same objectives. Teachers should modify the materials in these cases while retaining compatibility with the purpose of designers. The research's focus is to illustrate the nature of transformations and how learning from repeated uses of curriculum resources impacts the notion of alignment.

The third theme is how curriculum resources influence instruction. It focuses on how messages and structure in materials influence instructional outcomes from using the materials. Both the documentation approach and participatory perspective describe the role that curriculum resources play in the ways teachers use them, as outlined by Gueudet and Trouche (2009). The influence of characteristics of curriculum resources on teachers' use of those resources is often implicit, especially when the design of materials is culturally bound to the context in which the resources are used. The design of curriculum materials can significantly influence how teachers use the resources to address their instructional goals.

The fourth theme depicts how curriculum features are purposefully designed to achieve an educative purpose. This theme emphasises how curriculum resources' design features can drive users to engage in new content or materials. Curriculum resources may intentionally

propel teachers to learn new instruction and teaching materials in the learning environment. Teaching materials may transform how teachers use them and help teachers better understand the designers' choices in using the materials. These teacher resources include anticipated student solutions, descriptions of and rationales for how content is developed within and across units, and other elaborations of the designers' thinking and intent. Understanding a task's function within a sequence helps teachers understand how to evaluate student thinking and adjust their teaching (Choppin, 2011; Gravemeijer, 2004). Identifying curriculum components can reduce teacher attention on curriculum components and increase the cognitive load to implement the intended curriculum concepts. Even though teachers 'substantively transform' these resources, believing that they will lead to productive student activity, they still generally base their work on the creator's designs.

The last theme is the integration between design and usage. Teachers are involved in new design practices in digital resources, as they collectively contribute to the design of materials and choose materials for lessons. The emergence of digital curriculum resources has blurred the boundaries between the designer and the user. Commonly, teams of the external context designed curriculum resources to use these resources (Gravemeijer, 2004). However, the emergence of digital curriculum resources has provided an insight for teachers to engage in design work (Pepin et al., 2017), both at the point of the resources' commencement and transforming them into instructional sequences. Two stages signal greater teacher involvement in the design process in this work. First, groups of teachers collectively developed the materials' initial iterations, which continue to be developed as more teachers use and contribute to the materials' development. Second, teachers did not rotely adopt the curriculum resources; instead, they were incorporated into broader resource systems. The teacher drew and adapted as they developed their digital curriculum.

While Choppin et al.'s (2018) original concept of curriculum ergonomics focuses and discusses the teacher's role within curriculum design and its implementation, this paper contextualises the five curriculum ergonomics teacher-educator interaction between ITE curriculum designer and user in the Indonesian higher education sector. The first – two themes will discuss the ITE teacher-educators relationship and capacity to implement the KKNI curriculum and the alignment between written curriculum (KKNI) standards and curriculum design (intended and enacted curriculum). The third will highlight the influence of written curriculum (KKNI) on the ITE curriculum and instructional practices. The last three themes will contextualise how KKNI deliberately forces the ITE program and ITE teacher-educators to the new form of instructions and integrate the written curriculum (KKNI) with ITE enacted curriculum and its classroom implementation.

5. ITE Curriculum from a Curriculum Ergonomics

Teachers, including teacher educators, play a pivotal role in implementing a curriculum as a system regulating the classroom's learning process, which involves the theory and principles

of pedagogy to meet students' needs, weaknesses, and skills. A learning environment adapted to students' conditions will impact students' learning performance (Choppin et al. 2018; Smith, 2007). Initial Teacher Education (ITE) is responsible for producing qualified teachers who are skilful in interpreting the theory and principle of pedagogy in their teaching practices. However, the frame of ITE in most countries is tailored not only by history, culture, economics, but also politics (Craig, 2016; Flores, 2017). Thus, in improving teacher competencies, several countries have carried out several curriculum reforms. From CE perspectives, the interactions between curriculum design and its implementation in the ITE sector differ. The literature has documented ITE curriculum design (and reforms) interactions and its use in several contexts, namely Russia, Spain, and Brazil.

The interactions of ITE curriculum design and its use in Russia are portrayed within curriculum reform. Valeeva and Gafurov (2017) portray the ITE curriculum reform in Russia by addressing the policy makers' intention to connect teachers' goals with students' achievements. Here, within the CE perspectives, there happen some interactions between curriculum design and its enactment. The Russian 'Teachers Professional Standard (TPS)' is viewed as the curriculum control. Based on this standard, ITE programs across Russia design their ITE curriculum. This TPS-based ITE curriculum is enacted within the teacher training programs to reach the teachers' standard demands. Unfortunately, Valeeva and Gafurov did not mention teacher educators' role within this enactment, whether curriculum designers or merely curriculum enactors or technicians.

Sancho-Gil, Sanchez-Valero, and Domingo-Coscollola (2017) also explored the curriculum reform in Spain, mainly to investigate the link of theories and practices and the role of research. The two projects' analysis identified that Spain's curriculum's reformation experienced three distinct phases to improve ITE capacities in interpreting the theories into practices and the research project. The initiation of increasing ITE capacities in Spain has always attracted criticism demanding the elected government make changes in education policy. Sancho-Gil et al. reveal that in each stage's recommended curriculum, the ITE found it was hard to transform the theory in the classroom practices due to lack of education background and experiences. Besides, the distribution of the core and optional subjects in the curriculum for each semester, procedures in selecting the school and mentors, deficiency of specific training for mentors in university and schools, and school tutors' working atmosphere were parts of the problems during the reforms.

In line with the previous research, Marcondes, Leite and Ramos (2017) review the study about the ITE curriculum in Brazil through policy documents analysis and literature review. The executive echoed the curriculum's reformation by launching the grand called the 'Government Grant Programme' for ITE in 2009. The grant aims to foster and value teaching careers because many public school teachers lack knowledge and skill of pedagogy and subject matters and improve teacher education throughout Brazil. Concerning theory and

practice, universities are regarded as the venues to strengthen the teachers' theory, while the schools are the places for interpreting the theories into practices.

The government set the ITE curriculum to develop teachers' professionalism in manifesting pedagogy theory into practice and research based on the study mentioned earlier. However, the role of ITE in the curriculum site was just as the user, which is far from CE's intention. CE highlights the connection between teachers as curriculum designers and users. Being able to design a curriculum, one should have enough theory and professional practices.

6. NQF-Based ITE Curriculum: The Context of Indonesia

Indonesia is one of the countries that regulate NQF as a national reference for higher education curriculum design. Enacted since 2012 under Presidential Decree No. 8 and other several related regulations by ministries, particularly the Ministry of Research, Technology, and Higher Education (Higher Education Law No.12 of 2012), Indonesian higher education institutions are demanded to reform their curriculum based on the Indonesian NQF standards. In curriculum ergonomics, NQF is viewed as a curriculum resource at the national level. Before the NQF, the Indonesian government had enacted several standards for higher education curriculum. The development of the curriculum in Indonesia has eight phases of determination and several changes. The Indonesian government established the first to third phases from 1961 to 2002. The next phase is developed according to the characteristics of each curriculum. In 2005, the higher education curriculum was developed by the university. Nevertheless, five years later, the Ministry introduced a competency-based curriculum.

Indonesian universities have adopted the Indonesian Qualifications Framework (IQF) to run their education concerning curriculum reform. IQF refers to a framework that compares, equalises, and integrates qualifications due to education, work training, and work experience to provide appropriate work competency recognition with work structures in various sectors' (IQF, 2020, 7). The IQF serves as a reference for capacity development for the human capital of Indonesia. This framework is enacted by the Directorate General of Higher Education (DGHE), Ministry of Education and Culture, and is built on Presidential Decree No. 8/2012. The framework encompasses nine levels of qualifications, from Level 1 as the lowest to Level 9 as the highest. These nine qualifications are divided into three sections: operator (Levels 1-3), technician or analyst (Levels 4-6), and expert (Levels 7-9). Academic (higher education) programs are categorised as Level 6. In principle, these programs focus on knowledge and science (Oktadiana & Chon, 2017). Students of these academic programs must complete a certain number of credit units to complete their study. For example, to complete his/her study, a bachelor student must fulfil from 144 to 160 credit units within four years of study (DGHE 2011).

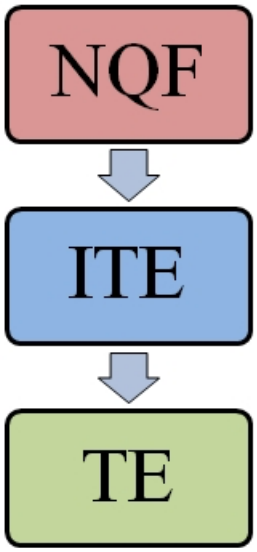

Figure 1. The interactions of NQF, ITE, and teacher-educator (TE) from a curriculum ergonomics perspective

NQF may be regarded as the curriculum controller for an independent-designed higher education curriculum from the curriculum ergonomics lens. In ITE, although teacher-educators are the curriculum designers, they are controlled by the standards of NQF. This framework controls and directs its course structures, learning outcomes, graduate profiles of pre-service teachers. Indonesia has a specific quality control called the National Accreditation for Higher Education (BAN-PT), which accredited higher education institutions based on NQF standards. To understand NQF, ITE, and TE's interactions, we suggest six key themes, as adopted from Choppin's (2018), for ITE curriculum interactions in the Indonesian context.

1) Teacher educators relationship with and capacity to use curriculum resources

Implementing the IQF curriculum in Indonesia is held by enacting several professional development workshops starting from the Ministry of education, a university, and a faculty to help the study program develop the curriculum. Furthermore, the study program forms a curriculum development team responsible for formulating its vision and mission. The team consists of lecturers with more than ten years of teaching experience and have pedagogical knowledge. This vision and mission is the basis to shape graduate competency standards, graduate profiles, graduate learning outcomes, courses, and course credits. Formulating the courses needs an analysis of the theory to reach graduate competency standards and graduation profiles. After determining the courses that would later support the vision and mission's achievement in the next few years, the team distributes the courses into eight semesters. Then the study program socialises the results of the curriculum reform to all lecturers. After all the lecturers agree on the curriculum, each lecturer creates a lesson plan

for the taught subjects. Next, the study program creates a category of scientific fields in which the material scope is addressed to avoid a mismatch in material selection in each parallel class.

2) Alignment between reference, design and use

The critical concept of curriculum ergonomics within the National Qualification Framework (NQF) is the alignment between the use of written curriculum (curriculum document), intended curriculum and its enactment in the classroom. In this context, the higher authority of curriculum design is handed down by a multi-layered curriculum development process flowing from the Directorate General of Higher Education (DGHE), Ministry of Education and Culture, Initial Teacher Education (ITE), and teacher educators. At the ITE level, a local curriculum is designed by the teachers or teacher educators within curriculum development. Teachers or teacher educators elaborate the written curriculum as the core curriculum resources into the intended curriculum (e.g. lesson plan). In this stage, the core curriculum might not have the same goal between the written curriculum and the intended curriculum due to the different capacities, background knowledge, and educational background of the teacher educators in designing an instructional plan. For this reason, the alignment between the designers and the users energise the curriculum enactment in the classroom.

3) Influence of curriculum reference and materials on instructional practices

The National Qualifications Framework (NQF), a framework designed to improve 'relationships between education and training structures on the one side, and labour markets on the other, promotes learning outcomes.' Learning outcomes are the internalisation and accumulation of knowledge, skills, practical knowledge, affections, and competencies achieved through structured education and covering a particular field of knowledge or expertise or experience. These learning outcomes are internalised into four descriptors in NQF: knowledge, skills, social competence, and self-competence. The four descriptors are contained in the study program curriculum, stated in detail in the teacher's lesson plan in the classroom.

4) Curriculum reference that purposefully pushes ITE programs to new forms of curriculum design

Regulated as a curriculum reference, NQF has purposefully pushed ITE programs to engage in new curriculum design forms, as enacted in the Indonesian context. Like other higher education programs, policymakers must demand ITE curriculum design to follow this framework's standards. They are expected to produce high-quality teachers later absorbed by the educational 'industry', including schools and private tutoring companies. From the nine qualification levels of the Indonesian Qualifications Framework (IQF) - about to the ASEAN Qualifications Reference Framework (AQRF), ITE stakeholders must design a specific

curriculum that enables its graduates to the position at level 6 (technician or analyst), not lower than that. To monitor the enactment of NQF standards within the curriculum designs of thousands of higher education programs, including ITE, the Indonesian government mandates BAN-PT to accredit these programs based on their success in adapting the framework's standards within their curriculum designs. As a result, a wave of curriculum reforms has happened within these programs. If they succeed in designing a new NQF-based curriculum, they will get the highest accreditation score (A). If they fail in some aspects, they will get lower scores (B or C). These high-stakes scores may affect the programs' credibility, particularly for new student recruitment and graduate work absorbance. For example, civil servants' national recruitment requires at least a B grade for the programs where the participants graduate.

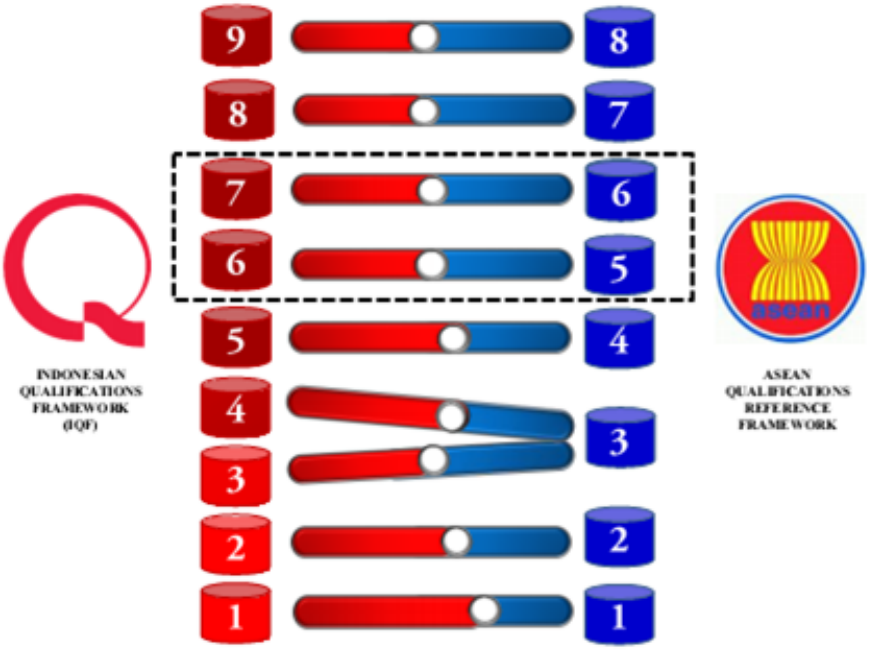

Figure 2. Comparison of IQF and ASEAN Qualifications Reference Framework (AQRF) level descriptor alignment (Source: IQF, 2020)

5) NQF-based ITE curriculum design that purposefully pushes teacher-educators to new forms of instruction

When ITE curriculum design has finally transformed based on the NQF standards, this design then pushes teacher-educators to engage in new instruction forms. They are demanded to collect NQF-based curriculum resources to help them achieve the framework's goals based on learning achievements (LA) and graduate profiles (GP). The framework also controls the subjects taught by these teacher-educators as they should align with LA and GP. Teacher-educators have sometimes enacted instructions that are different from that designed to align their materials with the NQF-based curriculum design. It can happen in the design of the texts

that teacher-students encounter and the design of teacher-educator support materials. Within the lens of teacher-resources curriculum ergonomics, Choppin et al. (2018) suggest that 'curriculum resources can help to engineer new forms of instruction, through the perspectives and structure evident in the presentation of content and ... activities in the student text and the kinds of support, such as the *arc of learning*, provided in the teacher resource materials' (p. 8). In the ITE context, teacher-educators can utilise curriculum resources to help them engineer new forms of instruction. In addition to this, curriculum resources can focus teacher-educator attention on particular aspects of instruction and reduce the cognitive load required to pull off ambitious instruction forms. Though teacher-educators still substantively transform these resources as they use them, even in ways aligned with the designers' intentions, they still rely on the designers' work because they believe it will lead to productive student-teacher activity.

6) Dissolving boundaries between NQF, ITE, TE, and curriculum use

It is still a long way to dissolve the boundaries within the complex interactions of NQF, ITE, TE, and the use of NQF-based ITE curriculum at the classroom level. However, the emergence of digital curriculum resources has provided an entrée for teacher-educators to engage in design work, both at the point of the resources and transforming them into instructional sequences. The emergence of digital curriculum resources potentially creates new analytic categories that distinguish the distance between NQF-based ITE curriculum designers and their users, namely teacher-educators. Here we suggest three categories to decrease the distance between designer and user in the NQF-ITE-TE context: resources designed for use by teacher-educators with no interaction with the original designers (most conventional resources); resources designed for use by teacher-educators in interaction with the original designers (NQF and ITE curriculum designers), including playing a role as designer beyond their classrooms; and materials in which the teacher-educator is the original designer.

7. Conclusion

This paper contributes to the study of curriculum design and use, particularly in the ITE sector underpinning the National Qualifications Framework through the lens of curriculum ergonomics. We have presented the complex interactions between NQF, ITE, teacher-educators as a curriculum reference, a curriculum design, and this curriculum's users, respectively. Adopted from Choppin's, we have also pinpointed six key themes within the NQF-ITE-teacher-educator relationships. We then conclude that: 1) curriculum ergonomics is a valuable tool for analysing the interactions between curriculum design and use, particularly in the ITE context, 2) the use of CE can be expanded not only in the contexts of teachers and mathematics education, as it is initially conceptualised by Choppin et al. (2018), but also to teacher-educators in the ITE sector, 3) while this study contributes in a body of

research in curriculum studies, particularly in the higher education and the ITE sectors, this conceptual study also contributes in the growing body of NQF studies. The ergonomics of curriculum design and use develops empirically supported principles for supporting teacher-educators capacity to understand and utilise curriculum resources to design and enact productive adaptations. This study endorses curriculum ergonomics as a valuable tool to help teacher-educators and ITE stakeholders adopt and enact curriculum materials, particularly in the NQF contexts. It will help them identify and provide support and potential barriers to use the curriculum resources successfully. Assuredly, policymakers and curriculum developers in other NQF-based countries may use these key themes to adapt NQF as the curriculum reference for ITE programs in their contexts. We want to argue that teacher educators should move their pedagogic practices beyond the comfort zone by playing critical roles as curriculum designers, developers, and makers to adapt the official curriculum into their pedagogic practice contexts. Thus, teacher educators should see themselves as agents of change in any educational policy and curriculum development.

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