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Integrative teaching and learning: reflections of a complex world in the curricula of primary teacher education programs

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ABSTRACT

Background: Acting in a changing world demands a holistic understanding of complex phenomena. Teacher education must therefore equip candidates with both knowledge and skills in integrative teaching and learning.

Purpose: This study investigates how integrative teaching and learning are reflected in the curricula of Finnish primary teacher education programs during the academic year 2024–2025.

Methods: The curricula of ten Finnish primary teacher education programs were analyzed using both data-driven and theory-guided content analysis.

Results: Five categories of courses reflect integrative teaching and learning: explicitly designed courses, subject-specific courses, integrative courses, studies in educational theory, and supervised teaching practice. These revealed four main approaches to integration: general integration, curriculum-driven integration, subject-based integration, and transdisciplinary integration.

Conclusions: The findings provide tools for reflection and curriculum development in primary teacher education.

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We request co-first authorship due to equal contribution to the article. Iida-Maria Peltomaa and Ulla Hietamäki contributed equally to this manuscript in terms of research design, data analysis, and manuscript writing. We also request for co-corresponding authorship.

Introduction

This article considers the university level primary teacher education curricula in Finland, especially from the perspective of integrative teaching and learning. A focus on integrative teaching and learning in education arose from the realization that the world is in a state of constant change, which requires the development of broad thinking skills and an understanding of complex phenomena in all arenas including education and training (S. M. Drake & Reid, 2018). It is also recognized that learning that crosses subject boundaries strengthens broad-based competencies, which are needed for working life (S. M. Drake & Reid, 2018; McPhail, 2018). Teacher education must therefore not only stay up-to-date, but also look beyond the present into the future. Teachers need to be prepared to view the world broadly, and they must tackle its phenomena with effective pedagogy (Kilpi et al., 2025).

Contrary to these aims, both basic education and teacher education have traditionally been organized along clear borders between subjects (Lam et al., 2013; Lehmann, 2022; M. Niemelä & Tirri, 2018). This has produced what some argue is a fragmented body of knowledge for students to acquire (M. A. Niemelä, 2021). The concept of integrative teaching in Finnish basic education has been held up as a solution to these challenges. In practice, this means, for example, the promotion of *integrative learning modules (ILMs)* in Finland's national core curriculum for basic education (Finnish National Agency for Education, 2016a). The curriculum directs schools to offer students at least one ILM per year (Finnish National Agency for Education, 2016b). These principles in Finnish basic education mean that teacher education programmes need to address teachers' capacity to teach in an integrative manner, including the above-mentioned ILMs.

Ideally, teacher education programmes would be able to address these challenges and prepare teacher candidates to plan, teach, and assess in an integrative manner. However, the degree to which the commitment to integrative teaching is reflected in the different Finnish universities' primary teacher education programmes varies, as there is no national teacher education curriculum. This may create unevenness in the ability of primary school teachers graduating from different universities to teach in an integrative manner (M. A. Niemelä, 2019; M. Niemelä & Tirri, 2018). Therefore, it is important to gain an understanding of the extent to which integrative teaching and learning is addressed across the teacher education programmes in Finland.

To illuminate this, we analyzed the curricula of 10 primary teacher education programmes across eight Finnish universities. The research question guiding our inquiry is, *how are integrative teaching and learning reflected in the curricula of primary teacher education programmes in Finland?*

The dataset consisted of the curriculum texts of those courses that were compulsory for all students in each primary teacher education programme in the academic year 2024–2025. In this study, the curricula were analysed by using both data-driven and theory-guided content analysis (Graneheim et al., 2017). The first phase involved data-driven analysis, and the findings revealed that integrative teaching and learning were represented across five distinct categories: (1) courses explicitly designed to support integrative teaching and learning, (2) subject-specific courses, (3) integrative courses in which two or more subjects were taught together, (4) studies in educational sciences, and (5) supervised teaching practice. The second step involved theory-driven analysis and

facilitated the coding of curricular goals and content into theory-flexible and theory-guided categories. The theory-flexible category included general integration and curriculum-driven integration, while the theory-informed categories comprised subject-based integration and transdisciplinary integration. The findings of this study have implications for further development of primary teacher education and curricula to improve teacher candidates' readiness to teach in an integrative manner.

Theoretical background: integrative teaching and learning in the Finnish context

Integrative learning and the teacher's role in Finnish basic education

In the 1970s, Finland's education system underwent a major structural change with the introduction of comprehensive school reform. The previous dual-track system, which separated students into primary and grammar schools at an early age and contributed to segregation and inequality, was replaced by a uniform comprehensive school system covering basic education (grades 1–9) and its curriculum (A. K. Ahonen, 2021; S. Ahonen, 2003).

Since then, Finland has revised the National Core Curriculum (NCC) for Basic (Primary and Lower Secondary) Education approximately every 10 years. The current NCC was implemented in 2016 (Finnish National Agency for Education, 2016a). It is structured in two parts. The first part sets out the general principles, objectives, and structures of basic education, including values, conceptions of learning, transversal competences, support for learning and welfare, and the role of schools as learning communities, thereby forming the foundation for subject curricula. The second part defines the mission, objectives, core content, and assessment of individual school subjects (Hakala & Kujala, 2021).

The NCC articulates two avenues for integrative teaching and learning. The first consists of seven interrelated transversal competences, described in the first part of the curriculum.

(1) Thinking and learning to learn
(2) Cultural competence, interaction and self-expression
(3) Taking care of oneself and managing daily life
(4) Multiliteracy
(5) ICT competence
(6) Working life competence and entrepreneurship
(7) Participation, involvement and building a sustainable future (FNAE, n.d.)

This emphasis on transversal competences grows from a critique of each subjects' core contents and its ability to provide students with future skills (see Halinen & Jääskeläinen, 2015). To ensure the status of the transversal competencies, they have been linked with each subject's main objectives and key content areas (Finnish National Agency for Education, 2016a). As such, the NCC clearly creates links between the competencies and the subjects. According to Hardy and Uljens (2018), 'the movement towards emphasizing general objectives instead of subject-matter teaching is a fairly dramatic shift in the Finnish education culture' (p. 64).

The second avenue concerns the instruction of integrative teaching. According to the NCC, integrative teaching involves examining real-world phenomena across subject boundaries and requires a pedagogical approach that addresses both instructional content and methods. Integration can be implemented through various strategies, including parallel study (examining the same theme simultaneously in multiple subjects), sequential study (studying thematically related subject-specific content consecutively), the formation of integrated subject clusters, or the application of holistic instruction, in which all teaching is organized around integrated themes. The chosen method and duration of integration may vary according to students' needs and the instructional objectives (Finnish National Agency for Education, 2016a).

In addition to general integration, the NCC introduces the concept of integrated learning modules (ILMs), longer-term entities that involve multiple subjects and may incorporate the aforementioned variety of integrative methods. It is mandatory for all basic education schools in Finland to provide at least one ILM per academic year for each student. Teachers coordinate the content and objectives of different subjects, for instance, by addressing environmental issues simultaneously in science, geography, and arts, thereby fostering a holistic understanding of the topic (Cantell, 2015). All subjects should be included in ILMs at different times and to the extent required by the topic in question. The design of ILMs is supposed to take into account students' needs, interests, and prior experiences (Mård & Hilli, 2022).

Further, certain subjects are considered inherently integrative. For example, environmental studies draw from five areas of science: biology, geography, physics, chemistry, and health education. This is based on the premise that the complexity of natural systems requires understanding from various disciplines and that effective integrative teaching is essential for learning about real-world phenomena (Chen, 2007; You, 2017). In addition, Finnish language and literature and Swedish language and literature (for students whose home language is Finnish or Swedish, respectively) integrate content and skills from multiple disciplines: language, literature, drama, media education, communication and multiliteracy skills, language awareness, and knowledge of cultures (Finnish National Agency for Education, 2016a). However, a subject being considered integrative does not automatically mean that teachers purposefully create links across disciplinary boundaries within it.

Research on integrative teaching has indicated that the approach can yield positive results for both student learning and engagement (Land, 2013; Niemi & Kiilakoski, 2020; Ozkan & Umdu Topsakal, 2020) as well as teachers' motivation (Mård, 2020). The approach may be especially beneficial for low-performing students who reported an increase in academic self-efficacy when taught using an integrated curriculum, compared to those following a traditional, subject-specific curriculum (M. Tarnanen et al., 2021). Integrated learning, implemented through functional, participatory, inquiry-based, social, and affective pedagogical methods, deepens students' understanding of the meaning of learning and enhances overall learning outcomes (M. Tarnanen et al., 2021). Integrative teaching and learning can be described as functional and exploratory work (Lam et al., 2013), and may involve active learning approaches (M. Tarnanen & Kostiainen, 2020), such as project-based (Bell, 2010; Ergül & Kargın, 2014) or problem-based learning (Anazifa & Djukri, 2017; Hmelo-Silver, 2004).

Teachers are the key to the implementation of integrative teaching and learning. Thus, how the principles of integrative teaching described in the NCC are translated into practice by teachers varies widely across schools and classrooms (M. Niemelä & Tirri, 2018). Even though the NCC prescribes the above-mentioned integrative approaches, the curriculum in Finland is much less restrictive than in many countries, and basic education schools and teachers retain a great deal of autonomy in making instructional decisions (Haapaniemi et al., 2021; Peltomaa & Paterson, 2020).

Integrative teaching and learning in Finnish primary teacher education programs and curricula

Internationally, teacher education programmes typically consist of education in subjects, educational theory, subject didactics and guided practice in schools (Elstad et al., 2023). Educational theory draws on various perspectives from disciplines such as philosophy, psychology and sociology, and teacher candidates are also taught subject content, subject didactics and contents from diverse other fields of scholarship. Thus, teacher education is an interdisciplinary effort, and teacher education units are communities of experts from a variety of disciplines and fields of study (Hökka & Eteläpelto, 2014). Teacher education curricula are one way to organize these goals and contents within degree programmes. In this study we draw on the notion that a curriculum is a socially negotiated document that rests on certain societal and institutional values and assumptions about the nature of knowledge, and that a curriculum, rather than suggesting direct pedagogical approaches or methods, places certain limits, constraints and possibilities on educational activity (Young, 2014; see also Lam et al., 2013; M. Niemelä & Tirri, 2018).

Teacher education in Finland is research-based, as emphasized by both universities and the Ministry of Education and Culture (Toom et al., 2010). It aims to build teaching on the basis of new research findings and requires teacher educators to actively conduct research in the field of teaching (Furuhagen et al., 2019; Hansén et al., 2023). Teacher candidates are expected to build their competence and professionalism by writing academic theses (Eklund et al., 2019) and combining theoretical knowledge and practice in their work as teachers (Hansén et al., 2023; Harju-Luukkainen et al., 2022; M. Tarnanen & Palviainen, 2018). Teacher candidates' professional development is considered to begin during their degree programme, as they start building the foundation for their pedagogy (Eklund et al., 2019). Teacher education emphasizes candidates' reflective work in combining theory and practice (Puustinen et al., 2018), describing everyday practices objectively, and applying scientific thinking to their own working theory (Furuhagen et al., 2019; Hansén et al., 2023). Active participation in research and development strengthens teacher candidates' reflexivity and critical thinking skills (Eklund et al., 2019). This way, they become active agents who continuously develop their own thinking and learning (Puustinen et al., 2018).

The quality of the Finnish education system rests on high-quality university-level teacher education. Its aim is to ensure quality and equal education for all students in basic education (Hansén et al., 2023; Harju-Luukkainen et al., 2022). Modern Finnish teacher education, in which all teachers receive a university degree, was established in the 1970s (P, 2012). Every teacher education institution has a research-based programme, and all teacher candidates complete a master's

degree, consisting of a three-year bachelor's programme followed by a two-year master's programme (Furuhagen et al., 2019). The teacher education programmes do not follow a national curriculum, but are designed to meet the requirements of certain laws concerning teacher qualifications (Decree on Qualification Requirements for Teaching Staff 986/1998 1 a §), as well as the pedagogical and organizational needs of schools expressed in the NCC and in the Basic Education Act (28 August 1998/628).

To qualify as primary school teachers (grades 1–6, ages 7–12), candidates complete a master's degree in education. The compulsory studies encompass educational theory, training and teaching, languages, communication and ICT, and the foundations of scientific research, thereby providing a research-based foundation for teaching competence. In addition, the degree includes elective studies and supervised teaching practice.

To qualify as subject teachers (grades 7–9, ages 13–15), candidates complete a master's degree that includes at least 60 ECTS of subject-specific studies in each subject they are qualified to teach, along with 60 ECTS of pedagogical studies. Primary school teachers may extend their qualification to a subject teacher degree by completing an additional 60 ECTS in a specific subject.

Importantly, the primary teacher degree requires studies in subjects and cross-curricular themes taught in primary school. These studies comprise sub-courses totalling 60 ECTS. They provide the subject-specific qualifications required for teaching in grades 1 to 6 and are therefore a mandatory element in all Finnish primary teacher education programmes, typically included in the bachelor's degree. While the overall framework for these studies is stipulated by national guidelines, the structure and content of specific courses may vary between different universities. On completion, these studies enable teachers to plan and implement teaching and to assess student learning in different subjects in grades 1 to 6 (Decree on Qualification Requirements for Teaching Staff 4 §3.11.2005/865).

In other words, all future primary school teachers are to acquire at least basic knowledge of all subjects but also their didactics. Interestingly, by emphasizing both separate subjects and cross-curricular themes taught in primary school, the Decree on Qualification seems to require expertise M. Niemelä and Tirri (2018) call integrative content knowledge. They demonstrated that to implement integrative education, teachers need to have knowledge on the connections between subject contents and curricula as well as the ability to make those connections comprehensible, but these are not usually covered in Finnish teacher education. M. Niemelä and Tirri's (2018) discussion addresses subject teacher education, but the same conclusions could be made regarding primary teacher education.

Research on integrative and student-centred interventions in primary teacher education have further suggested that integrative pedagogical knowledge involves understanding different ways to produce knowledge in different disciplines (Rantala et al., 2019) and knowing how to support student learning, self-management, and collaboration (M. J. Tarnanen et al., 2019). Learning to implement integrative education can also be seen as part of teachers' developing professional agency, where the ability to see one's expertise fitting to a task plays a central role, together with a sense of collective agency, or reaching an optimal end-result through combining expertise with colleagues (Kimanen et al., in press).

Conceptual distinctions

Educational research, curricula, and policies dealing with the crossing of the traditional boundaries between subjects are rich with terminology aimed at explaining at least partially the same phenomenon (Fooladi et al., 2023), albeit with certain nuances and histories (McPhail, 2018). While it would be impossible to offer a comprehensive list of all the terminology used in this field, here we have chosen to examine a few concepts we consider important for understanding the premise to our investigation on how integrative teaching and learning are reflected in the curricula of primary teacher education programmes in Finland.

The main concept employed throughout this study is *integrative teaching and learning*, which is 'an umbrella term for structures, strategies, and activities that bridge numerous divides, such as high school and college, general education and the major, introductory and advanced levels, experiences inside and outside the classroom, theory and practice, and disciplines and fields' (Klein, 2005, p. 8). Integrative teaching and learning draw on both content from various school subjects and real-life phenomena, problems, and projects. Other terms for integrative teaching and learning are cross-curricular and transcurricular, which 'reflect school reality and the integration of school subjects and curricular areas, rather than concepts with disciplinary associations' (Mård & Klausen, 2024, p. 11).

Integrative teaching and learning can be examined through the levels of integration represented by multidisciplinary, interdisciplinary, and transdisciplinary approaches (S. M. Drake, 1998). Multidisciplinary and interdisciplinary approaches both rely on *subject-based integration*, but they differ in how the integration is structured. In a *multidisciplinary approach*, concepts and methods from two or more disciplines are applied to examine the same topic (Venville et al., 2012). However, the disciplines 'speak as separate voices' (Klein, 2006, p. 13), and the task of integration can be left to the students. In contrast, an interdisciplinary approach integrates concepts and methods from several subjects into a coherent learning experience for students (Venville et al., 2012), with the disciplines serving as tools to study a theme, problem, question, or idea in depth (Lam et al., 2013). This requires teachers to actively integrate concepts and methods from multiple subjects in order to create such coherence (Rennie et al., 2012). In a *transdisciplinary approach*, disciplines are integrated in as holistic a way as possible (Venville et al., 2012). Phenomena and problems defined by students form the basis for teaching and learning, and subject boundaries become increasingly blurred (cf. Mård & Klausen, 2024; also S. Drake & Burns, 2004).

In considering multi-, inter-, and transdisciplinary approaches, it is important to note that 'one position is not superior to another; rather, different approaches are more appropriate than others according to the context in which they are used' (S. M. Drake, 1998, p. 19). In this study, we use the concept of a *theory-driven approach* to encompass both the subject-based and the transdisciplinary approaches to integrative teaching and learning.

As mentioned earlier, the NCC introduces a specific terminology to convey its idea of integrative teaching and learning, namely integrative learning modules. The NCC is not devoid of theoretical foundations, but rather than drawing on established concepts such as multi-, inter-, or transdisciplinarity, it employs a specifically constructed term to guide

implementation. In this study, we refer to this as a *curriculum-driven approach* to teaching and learning.

We also use the broader term *theory-flexible approach* to denote forms of integrative teaching and learning that do not draw on a specific theoretical framework; this includes both the curriculum-driven approach and what we call the *general integrated approach*, which refers to the overarching understanding of integrative teaching and learning.

Methods

This study examined the curricula of Finnish primary teacher education by focusing specifically on how integrative teaching and learning are manifested in them.

The dataset consists of curriculum texts from all eight universities providing primary teacher education in Finland. Two of these universities have filial units in another city, each with its own curriculum, resulting in a total of eight universities and ten curricula.

In the Finnish system, each university designs its own teacher education curriculum autonomously and revises it approximately every three to four years. The curricula were publicly available through the universities' official websites. For this study, only those courses that are compulsory for all teacher candidates in primary teacher education programmes were included; elective courses were excluded from the analysis. The texts are concise and define the core content and learning objectives of each course, leaving room for pedagogical freedom in their implementation. The analysis focused strictly on the curriculum texts, specifically the content descriptions and learning objectives, rather than on their practical interpretations or applications in teacher education.

The research team included at least one teacher educator representing each of the 10 curricula. The analysis of the data among the team proceeded in several iterative cycles. It began with an initial inductive, and data-driven content analysis (Graneheim et al., 2017) aimed at forming a preliminary and shared understanding of the teacher education curricula across different universities. Consequently, the analysis advanced towards a more systematic abductive reasoning process (Lindgren et al., 2020), in which concepts and theories identified in previous research were employed as an analytical framework (Graneheim et al., 2017).

In the next phase of the analysis, each participating university's curriculum was examined by its representatives. The analysis focused on linguistic expressions in the course content descriptions and learning objectives, which enabling the identification of the theoretical foundations underlying integrative teaching and learning. Each individual mention was considered an occurrence, making it possible to show that a single course could include occurrences related to one or more categories of interdisciplinary teaching and learning.

The overarching concept chosen to represent the entire classification was integrative teaching and learning. Categorization was then further refined based on theoretical commitments and descriptions depending on whether the curricular aims and contents of integrative teaching and learning in the courses reflected *theory-driven* or *theory-flexible* intentions.

In the theory-driven approach, we distinguished between *subject-based integration* and *transdisciplinary integration*. Subject-based integration refers to multidisciplinary and interdisciplinary ways of combining subjects, where the subjects themselves serve as the starting point for integrated teaching and learning (Fi. *Oppiainerajat ylittävä)*. By

contrast, transdisciplinary integration allows a phenomenon form the basis for teaching and learning without regard for subject boundaries (Fi. *ilmiölähtöinen*; cf. S. Drake & Burns, 2004; Mård & Klausen, 2024).

By *theory-flexible approach* we refer to curriculum texts that do not draw on a specific theoretical framework. Within this category, we distinguished between a *curriculum-driven approach* and *general integrated approach*. The curriculum-driven approach was characterized by texts that referred directly to the NCC and its concepts, such as ILMs (Fi. *Monialainen oppimiskokonaisuus*; Sw. *mångvetenskapligt lärområde)*. The general integrated approach was characterized by the absence of explicit theoretical starting points or references to the terminology of the NCC. Instead, it employed more generic wording, such as 'integrated' or 'cross-curricular' (Fi. *eheyttäminen*; Sw. *ämnesövergripande*), which refer to integrative teaching and learning in a broader, overarching sense (cf. Mård & Klausen, 2024).

Collaborative discussions among the members of the research consortium helped enhance the consistency and comparability of the analysis (see Patton, 2015). Researcher triangulation was strengthened through cross-examination, as the curricula of universities other than one's own were analysed. In doing so, previous interpretations were revisited and compared.

Finally, an analysis table was created to present the number of courses addressing integrative teaching and learning. The table included all courses in the participating universities' curricula that referred to integrative teaching and learning in either the course content or the learning objectives. Its purpose was to identify where in the studies integrative teaching and learning is addressed. Then, the occurrences related to the four categories of interdisciplinary teaching and learning within each course category were counted, and the results were presented in charts.

Examining the reliability and limitations of this analytical process is essential. First, the curriculum texts at times employed key concepts in vague and undefined ways, obscuring their precise meanings. In some instances the language of the curriculum documents echoed terminology from the FCC but was applied imprecisely. For example, the term *transversal learning modules* appeared as a conflation of *transversal competences* and *integrative learning modules*, blurring the conceptual boundaries between them. In addition, distinguishing analytically between multidisciplinary and interdisciplinary approaches proved challenging, as the texts referred to subject-based approaches without specifying whether they reflected a multi- or interdisciplinary orientation. For this reason, these approaches were grouped together. Finally, the conceptual frameworks and categorizations applied in the analysis itself inevitably influenced the findings (S. Drake & Burns, 2004; Mård & Klausen, 2024; Rennie et al., 2012).

Findings

The aim of this study was to examine how integrative teaching and learning are reflected in the curricula of primary teacher education programmes in Finland.

The analysis revealed that integrative teaching and learning was addressed across five distinct course categories (Table 1). Three of these were part of the mandatory 60 ECTS *Studies in Subjects and Cross-Curricular Themes Taught in Primary School*, which is included in all Finnish primary teacher education programmes: (1) courses specifically designed to support integrative teaching and

Table 1. Number of courses in which integrative teaching and learning was addressed.

	Multidisciplinary studies of subjects and cross- curricular themes taught in primary school				
Category	1. Courses specifically designed to support integrative teaching and learning	2. Subject-specific courses	3. Integrative courses	4. Studies in educational sciences	5. Supervised teaching practice
University 1a program	1				2
University 1bprogram	2		1		1
University 2a program	3		2		
University 2b program	3		2		
University 3 program		3	2	1	1
University 4 program			1		1
University 5 program		3	1		1
University 6 program	1		1		1
University 7 program			3		1
University 8 program		1	1	1	1

learning, (2) subject-specific courses, and (3) integrative courses in which two or more subjects were taught together. In addition, integrative approaches were identified in (4) courses in educational sciences and (5) supervised teaching practice.

Table 1 shows the number of courses addressing integrative teaching and learning in each of the five course categories across the examined curricula. Although the number of courses in each category varies, the table highlights the broader picture of where in the studies integrative teaching and learning is addressed.

The number of European Credit Transfer and Accumulation System (ECTS) credits per course ranged from 1 to 15. Except for category 1, it was not possible to interpret to what proportion each course was dedicated to integrative teaching and learning, and to what extent other aims and contents of the course were emphasized.

Category 1: courses specifically designed to support integrative teaching and learning (within multidisciplinary studies of subjects and cross-curricular themes taught in primary school)

As communicated in Figure 1, in the curricula of the 10 programmes, five programmes have chosen to design courses specifically to support integrative teaching and learning as proposed in the NCC. In two of the five programmes' curricula (University 2, programmes a and b), there are three courses for this purpose, while the other three programmes offer one course each. It is also noteworthy that half of the programmes do not offer customized courses for integrative teaching and learning.

The analysis revealed that the courses specifically designed to support integrative teaching and learning included broad and varied theoretical considerations. Most, or 11 of 32, occurrences indicated a curriculum-driven approach by referring to the ILMs of the NCC. This is expected, as the guidelines in the NCC have to a significant extent initiated

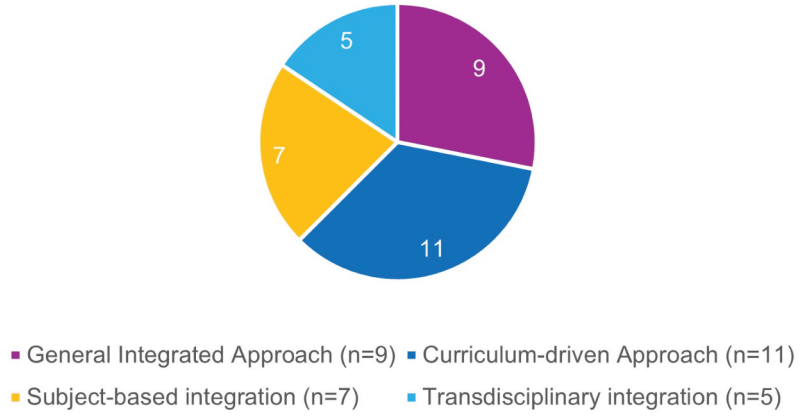

Figure 1. Occurrences in category 1 ($N = 32$).

the courses. However, there were also several occurrences representing the other approaches: general integrated approach (9/32), subject-based integration (7/32), and transdisciplinary integration (5/32). It should be noted that despite the occurrences of subject-based integration, the courses adopted a general approach in the sense that no specific subjects were mentioned in the aims and contents. Most of the courses combined several theoretical approaches in their aims and contents (as expressed in the excerpt below) and only a few contained a mere curriculum-driven approach.

In an integrated learning module:

- The teacher candidate understands various principles of integrative teaching, particularly subject-based and phenomenon-based approaches.
- The teacher candidate is able to plan and implement an integrated learning module that supports transversal competence development.
- The integration takes into account the diverse subject-specific pedagogical foundations of different school subjects and the national core curriculum for basic education. (University 6)

Category 2: subject-specific courses (within multidisciplinary studies of subjects and cross-curricular themes taught in primary school)

As communicated in Figure 2, in the curricula of the 10 programmes, three programmes have included notions of integrative teaching and learning in subject-specific courses of mathematics, Finnish/Swedish and literature, visual arts, and religious and worldview education.

Following the subject-specific basis of the courses, the analysis revealed subject-based integration as the most represented theoretical approach with 4 of 10 occurrences. 3 occurrences represented a curriculum-driven approach, with references to how the subject can be included in ILMs, and 3 occurrences represented a transdisciplinary approach referring to phenomenon-based teaching and learning involving the subject at hand.

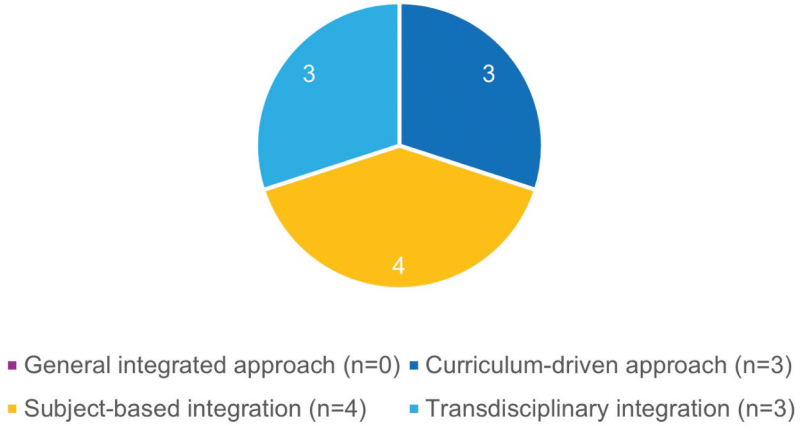

Figure 2. Occurrences in category 2 ($N = 10$).

> [The teacher candidate is able to] integrate mathematics learning situations across subject boundaries and contexts, apply theories related to mathematics learning in these situations, and identify the affective and emotional dimensions of their own mathematics learning.
>
> The subject of visual arts in integrative/holistic teaching and integrated learning modules. (University 3)
>
> [The teacher candidate is able to] use literary art as part of phenomenon-based teaching. (University 5) (University 8)

Category 3: integrative courses (within multidisciplinary studies of subjects and cross-curricular themes taught in primary school)

As communicated in Figure 3, in the curricula of the 10 programmes, nine programmes provide integrative courses in which integrative teaching and learning are part of the course aims and contents. The integrative courses differ from courses specifically designed to support integrative teaching and learning (Category 1) in the sense that they build on subject-related perspectives and combine different school subjects in various types of project-based or arts and crafts-based courses. The relationships between subjects included in the integrative courses can be more or less explored, depending on the course aims and contents.

The analysis revealed that the integrative courses included various theoretical considerations. Most occurrences (15 of 35) reflected a subject-based integration approach to integrative teaching and learning, emphasizing the subject-related identity of the courses. 8 of 35 occurrences indicated a curriculum-driven approach while the general integrative approach and transdisciplinary approach were represented by 6 occurrences each.

> The integrative course content brings together perspectives and viewpoints from various craft and art subjects. (University 4)
>
> [The teacher candidate]:

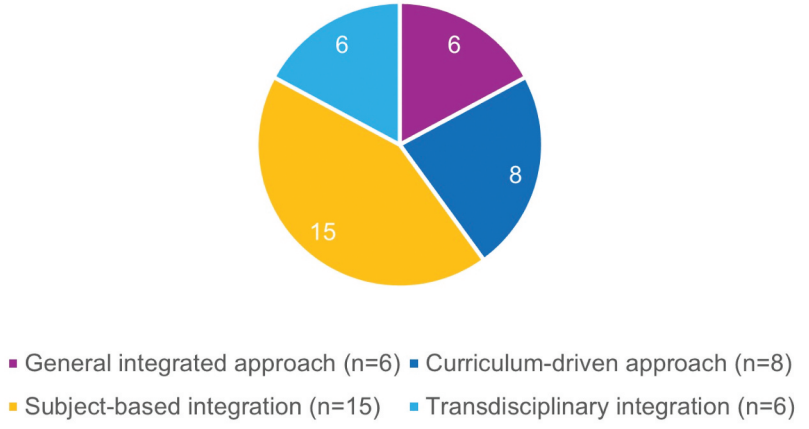

Figure 3. Occurrences in category 3 ($N = 35$).

> Is able to integrate themes, topics, and phenomena from the subjects of history, social studies, religious and ethical education, mathematics, and crafts.
>
> Is able to critically examine and justify the foundations and objectives of an integrated learning module. (University 7)
>
> [The teacher candidate] Demonstrates an understanding of the importance of multidisciplinary studies in subjects and learning modules taught in basic education for building professional expertise as a primary school teacher and for the teaching profession. (University 2, program b)

Category 4: studies in educational sciences

As communicated in Figure 4, in two out of ten programmes, the curriculum included studies in educational sciences that incorporated elements of integrative teaching and learning. In one programme (University 3), the course was included in the bachelor's

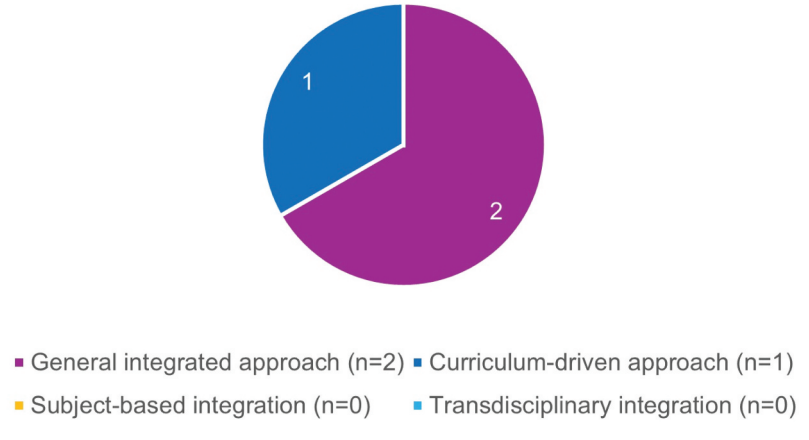

Figure 4. Occurrences in category 4 ($N = 3$).

degree programme, while in the other (University 8), it was part of the master's degree curriculum.

The analysis revealed that 2 out of 3 occurrences reflected a general integrative approach to integrative teaching and learning. 1 occurrence represented a curriculum-driven approach. In other words, all identified instances fell under theory-flexible approaches.

> Analysis of lesson planning from the perspective of transversal competences and integrated/holistic teaching (University 3)

> [Teacher candidate is able to] plan, implement, and assess instructional units that promote integrative teaching and learning (University 8)

Category 5: supervised teaching practice

As communicated in Figure 5, The aim of supervised teaching practice in Finnish primary teacher education programmes is to support teacher candidates in developing their competence and professionalism by bridging theoretical knowledge with practical experience (Hansén et al., 2023; Harju-Luukkainen et al., 2022; M. Tarnanen & Palviainen, 2018). Supervised teaching practice is a mandatory component of the curriculum in all Finnish universities offering a primary teacher education programme. In eight out of ten programmes, the curriculum included supervised teaching practice that incorporated elements of integrative teaching and learning.

The analysis revealed that 13 out of 20 occurrences reflected a curriculum-driven approach to integrative teaching and learning. 3 occurrences represented a general integrative approach. 4 occurrences reflected a theory-driven approach, with 2 related to subject-based integration and 2 to transdisciplinary integration.

All but one of the identified occurrences reflected a single, specific approach. In one instance, however, the curriculum-driven approach was combined with both subcategories of the theory-driven approach, subject-based and transdisciplinary integration, by offering teacher candidates the opportunity to choose between the two.

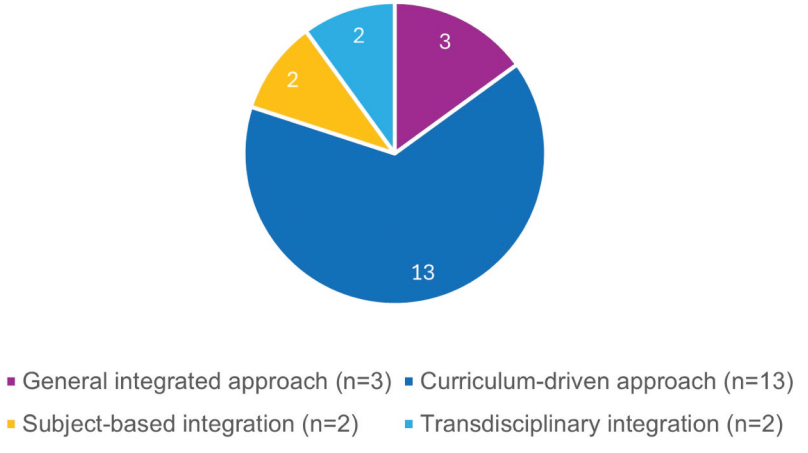

Figure 5. Occurrences in category 5 ($N = 20$).

[The teacher candidate is able to] design, implement and assess integrated learning modules. (University 8)

Students of educational sciences have the opportunity to implement an integrated learning module either through a subject-based or a phenomenon-based approach. (University 6)

Summary of categories

As communicated in Figure 6, altogether, the analysis revealed 98 occurrences reflecting integrative teaching and learning. The largest categories were the curriculum-driven approach with 36 occurrences, and subject-based integration with 28 occurrences. A general integrative approach was reflected in 20 occurrences, while transdisciplinary integration appeared in 14 occurrences.

Discussion

This study examined the curricula of Finnish primary teacher education programmes from an integrative teaching and learning perspective. Previous studies have raised the concern that teaching in primary education produces fragmented knowledge when it is organized along clear borders between subjects (Lam et al., 2013; Lehmann, 2022; M. Niemelä & Tirri, 2018). To address this concern, it is important to analyse how integrative teaching is reflected in current teacher education curricula. This study therefore provided a framework for collaboration between universities, enabling the further development of teacher education and fostering a research-based approach (Toom et al., 2010).

While teacher education and basic education curricula in Finland are structured around subject-specific objectives and content (Lehmann, 2022; M. Niemelä & Tirri, 2018), integrative teaching serves as an important way of crossing subject boundaries. All of the programmes whose curricular texts we analyzed included learning objectives and content related to integrative teaching in at least two different course categories. Integrated teaching and learning was mostly most often identified in categories 1, 2, and 3 of the multidisciplinary studies of subjects and cross-curricular themes taught in primary school,

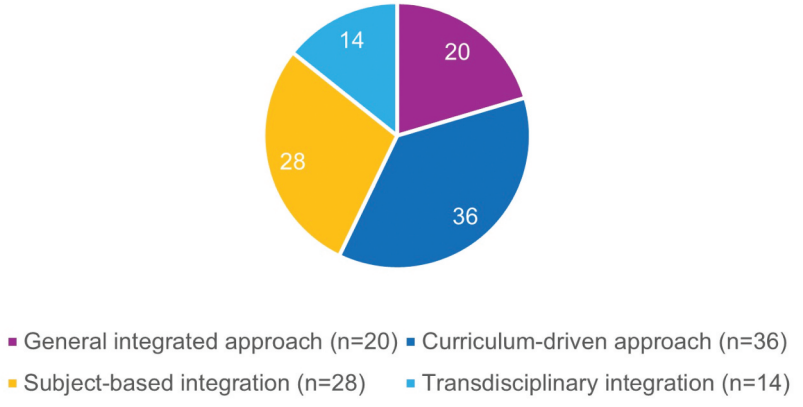

Figure 6. Summary of categories ($N = 98$).

as well as in category 4, which which comprised supervised teaching practice courses within teacher candidates' major studies in educational sciences

Most programmes were structured so that studies related to integrative teaching and learning occured during the bachelor's programme, while the master's programme emphasized the practical application of integrative teaching and learning through the implementation of ILMs in supervised teaching practice. These structural arrangements and continuities appear to be designed to promote synergy between the theoretical foundation and the practical application of integrative teaching and learning (Puustinen et al., 2018).

The following four approaches to integrative teaching and learning were identified: general integrated approach, curriculum-driven approach, subject-based integration, and transdisciplinary integration. Each of these approaches plays a distinct role in constructing teacher candidate expertise. The general integrated approach familiarizes candidates with concepts that refer to integrative teaching and learning in a broader, overarching sense (Mård & Klausen, 2024). The curriculum-driven approach introduces the requirements of the current NCC, subject-based integration provides integrative content knowledge (M. Niemelä & Tirri, 2018), and transdisciplinary integration develops the ability to address phenomena without disciplinary boundaries (Mård & Klausen, 2024).

The NCC leaves schools and teachers considerable autonomy in making instructional decisions when implementing integrative teaching and learning (Haapaniemi et al., 2021; Peltomaa & Paterson, 2020). When graduates of different primary teacher education programmes come together as colleagues in a school, they may need to address these differences by designing combinations of pedagogical and content-related practices (Mård & Hilli, 2024).

This study highlights the importance of teachers being familiar with all four of the above-mentioned approaches to integration in order to navigate them effectively within their schools and in collaboration with colleagues. According to Klein (2006), integrative teaching and learning is increasingly central to knowledge and must not remain peripheral to teacher education. While subject-specific training will remain essential, teachers also require a dual capacity grounded in an informed understanding of integrative contexts, definitions, curriculum design, pedagogy, and learning processes.

The programmes' approaches to integrative teaching and learning are important to consider in the context of the particularities of the Finnish teacher education system. The overarching aim and ethos of Finnish teacher education is to prepare master's-level teachers who are able to apply theoretical knowledge to classrooms practices (Furuhagen et al., 2019), and examine teaching from multiple theoretical perspectives, including an integrative perspective. Our analysis showed that integrative teaching and learning was evident in 8 of the 10 university programmes as part of supervised teaching practice, underscoring its role in enabling teacher candidates to apply theoretical knowledge in classroom contexts.

We believe that teacher education in an increasingly diverse world depends not on structural curricula of political reforms but on the willingness of educators, education institutions, and policy-makers to work together to imagine and implement meaningful changes in basic education for the future. Finnish teacher education is grounded in the autonomy of universities to educate teacher candidates as they deem most appropriate, which also places on them the responsibility for ensuring the quality of teaching and learning in their programmes. This study and

its collaborative research process have revitalized our shared understanding of the various opportunities for integrative teaching and learning within our programmes. Throughout the process, we have cherished the dialogue across universities in the spirit of advancing quality education. We hope that recognizing the diverse approaches to integrative teaching and learning across universities will enrich each institution's curriculum reform and foster greater criticality in future curriculum development.

This study provides an analytical tool for examining the approaches and structures of curricular texts with the aim of fostering more coherent, collaborative and future-oriented curriculum development. The analytical framework developed here is grounded in theories of integrative teaching and learning, indicating its broader applicability. We therefore suggest that curriculum researchers in other countries consider its use to explore the analytical potential of the framework in revealing how integrative teaching and learning is reflected in teacher education curricula.

As a limitation, we acknowledge that this study was based exclusively on written curricula; no classroom observations of teaching practices were incorporated. The analysis treated curricula as textual documents, and thus did not account for their enactment in classroom practice.

To deepen our understanding of the dimensions of integrated teaching and learning, further research is needed on how teacher education programmes' curricula reflect integrative competencies. Based on the present study, we also encourage all contributors in university curriculum development to actively engage in open dialogue and collaborative discussion so that we can ensure and enhance the quality of integrated teaching and learning in teacher education.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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