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Review article

Arts-based teaching and learning in teacher education: "Crystallising" student teachers' learning outcomes through a systematic literature review

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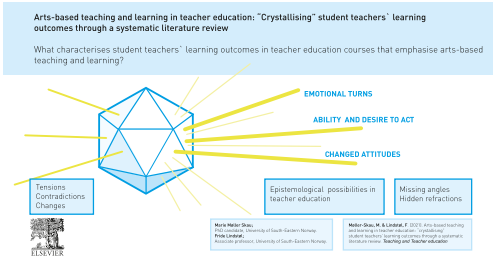
HIGHLIGHTS

- Teacher education courses that emphasise arts-based teaching and learning.
- Characteristics of student teachers' learning outcomes.
- Changes in emotions, actions, intentions and attitudes.
- Complexity shown through tension and meaningful connections.
- Epistemological possibilities in teacher education.

GRAPHICAL ABSTRACT



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ABSTRACT

This systematic literature review describes and discusses the characteristics of student teachers' learning outcomes in various courses that emphasise arts-based teaching and learning. A systematic search was conducted in 10 databases, and the sample consists of 19 peer-reviewed journal articles from 8 countries. The articles describe empirical studies from which the researchers' interpretations are synthesised inductively. Three patterns are recognised as (1) *emotional turns*, (2) *ability and desire to act* and (3) *changed attitudes*. The patterns are discussed through a "crystallisation" metaphor, and the conclusion proposes that the patterns create epistemological possibilities in teacher education.

Contents

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1. Introduction

Preparing future teachers for the 21st century requires new ways of thinking about teaching and learning (Darling-Hammond, 2006; Tican & Deniz, 2019), as rapid changes in the world call for more than superficial, formulaic knowledge and skills (Urbani et al., 2017, p. 27). The emerging process of globalisation, cultural diversity and economic unpredictability influence and change education (Robinson, 2010), and future teachers need to be prepared for an increasingly complex life and work environment (Bedir, 2019, p. 829). For example, the ongoing COVID-19 pandemic has shown how teachers are forced to deal with new and unpredictable challenges based on complex global situations (OECD, 2020). Teacher education should support student teachers' preparation for the unknown future (Bedir, 2019; Urbani et al., 2017), and more research that explores knowledge, skills and practices in teacher education seems to be requisite.

In this regard, some researchers argue that teaching and learning approaches involving a variety of art forms and aesthetic elements have qualities that could develop teacher education in the 21st century (Barnes & Shirley, 2007; Shockley & Krakaur, 2021; Watson, 2018). For instance, they highlight how these approaches could support future teachers to be creative (Ogier & Ghosh, 2018; Watson, 2018), open-minded, risk-takers (Shockley & Krakaur, 2021), critical (Hunter-Doniger & Herring, 2017), emotionally intelligent (Barnes & Shirley, 2007), engaging (Selkrig & Bottrell, 2009) and ready for diversity in future classrooms (Shockley & Krakaur, 2021). Additionally, these approaches to teaching and learning enable student teachers to think, plan and teach towards understanding across (Ogier & Ghosh, 2018) and beyond (Shockley & Krakaur, 2021) the curriculum.

However, scientific descriptions that emphasise the interplay among arts, aesthetics, teaching and learning are not new. These ideas have influenced educational science over the last century (Dewey, 1934; Vygotsky, 1974), and the view that education can learn from the arts has been widely discussed (Biesta, 2018; Eisner, 2002). A common understanding is that learning happens *in* as well as *through* the arts, and teacher education plays a significant role in enforcing these approaches in the educational system (Bamford, 2006, p. 79). For example, future teachers could collaborate with arts educators by bringing the arts into the classroom (Hunter-Doniger & Herring, 2017), integrate arts and aesthetic elements into various subjects to communicate content in alternative ways (Briseid, 2011; Pool et al., 2011), work in a cross-curricular way with arts products (Ogier & Ghosh, 2018) or develop a dynamic and diverse culture in the classroom through creative and inclusive processes (Shockley & Krakaur, 2021). When education is viewed from these perspectives, arts concern *all* future teachers, with multiple ways to integrate these phenomena into general education.

While many studies have discussed teaching and learning related to arts in art teacher education, less analytical attention has been paid to aesthetic phenomena in generalist teacher education. For example, Anne Bamford (2006, p. 79) has highlighted the need for reviews on arts in these contexts by emphasising the importance of arts-rich education. However, as student teachers in these programmes often lack arts experiences beyond their own school experiences (Leonard & Odutola, 2016; Patterson, 2017), they may not have the same skills or interests to be as creative and artistic as art student teachers. Considering this, it seems relevant to examine these topics in generalist teacher education to develop more systematic knowledge that could contribute to forming creative, open-minded and risk-taking teachers.

Therefore, we have conducted a systematic literature review based on 19 peer-reviewed journal articles. These articles have been obtained from a systematic search, conducted in ten databases. All articles describe empirical studies of teacher education programmes in eight countries, specifically the USA, Canada, the UK, Ireland, Norway, Spain, South Africa and Australia. The studies describe various courses that deal with one or several art forms as approaches to teaching and learning. We have synthesised the researchers' interpretations that shed light on student teachers' learning outcomes in these various courses. Although the authors of the 19 articles use different expressions and concepts to describe how art forms and aesthetic elements constitute or are integrated into teaching methods, tools, mediums, materials or resources, we refer to the umbrella term “arts-based teaching and learning” (Ogden et al., 2010, pp. 370–371; Shockley & Krakaur, 2021, p. 25) in this review. In this context, it involves various art forms, such as music, dance, drama, visual art, contemporary art, photographs and design, and the aesthetic elements of sounds, shapes, movements, metaphors, among others (see Table 1).

Theoretically, we approach arts-based teaching and learning through Elliot Eisner's (2002) understanding of the arts as a common term for many art forms, which can serve as a “model for teaching”. Eisner (2002, p. 3) claims that arts involve aspects that are essential for education and learners in general, such as the abilities to create oneself, expand consciousness, shape dispositions, satisfy the quest for meaning, establish contact with others and share culture. In addition, Eisner (2002, p. 197) emphasises how arts open up diversity in teaching and learning, as answers to questions, solutions to problems, and interpretations are

Table 1
Overview of the articles.

	Articles (N = 19)	Country	Arts/aesthetic elements	Type of course, activity, etc.	Expressions	Methods/data
1	Barnes and Shirley (2007). Strangely familiar: Cross-curricular and creative thinking in teacher education.	UK	Sounds, shapes, video images, photos, stories, plays, sculpture, art, music, dance, design technology, drama, poetry, etc.	Higher Education ARTS and School project (HEART) "Strangely Familiar" Outdoor experiences Includes children	Cross-arts	Meta-analysis; student teachers' research assignments, logged reflections
2	Briseid (2011). From theory to practice – with Living Story. Experiences from a cross-curricular project that connect subject and practical-aesthetical tools in student teachers' practicum [translated from Norwegian].	Norway	Drama, songs, lyrics, costumes, props, photo story, stories	Interdisciplinary project "Levende historie" [Living story] A history role play Includes children	Aesthetic tools/ elements [In Norwegian, *Estetiske virkemidler*]	Qualitative study; written reflections
3	Bhukhanwala et al. (2017). Beyond the student teacher seminar: Examining transformative learning through arts-based approaches.	USA	Drama, Play-Doh, pipe cleaner sculptures, drawings, paintings	Arts-based student teaching seminar Theatre of the Oppressed and other arts-based activities	Arts-based approaches/ practices/ activities	Qualitative study; photographs, artworks (pipe cleaner sculptures, drawings, paintings), written journals of reflections, video recordings of focus group interviews
4	Davies (2010). Enhancing the role of the arts in primary pre-service teacher education.	UK	Music, dance, drama, storytelling, visual art	Higher Education ARTS and School project (HEART) Performing arts week with workshop and performance Includes children	Arts integration	Case study, multi-method approach (qualitative and quantitative data); pre- and post-surveys, observation recorded using field notes, digital photographs and digital video, audio-recorded interviews
5	Franklin and Johnson (2010). Disrupting the taken for granted: Exploring urban teacher candidate experience in aesthetic education.	USA	Drama, including language, movement, physical setting and costuming (visual arts – not a focus of the study)	Theatrical performance and exploratory workshop "Secret History: Journals Abroad, Journals Within"	Aesthetic education, aesthetic line of inquiry	Qualitative case study, collaborative research study; survey, field observations and notes, interviews, classroom artefacts
6	Giorza (2016). Thinking together through pictures: The community of philosophical enquiry and visual analysis in transformative pedagogy.	South Africa	Visual contemporary art; art postcards, images, developing tools (postcards, dices, etc.)	"Responding to art" course – a visual analysis process Includes a guided tour of an art collection	Art education, incorporating the arts into the curriculum	Qualitative study; Students' writing, interviews
7	Hunter-Doniger and Herring (2017). Artistic realizations found in generalist preservice teachers' courses: Rigor, confidence and connections.	USA	Visual arts and performing arts (music, theatre, dance)	Course in arts integration Embedded field experience Includes children	Arts integration	Qualitative case study; pre- and post-surveys, interviews, observation
8	Jovè and Farrero (2018). Rethinking education through contemporary art.	Spain	Contemporary art	Pedagogical module exploring contemporary art in an art centre exhibition called "Voice between Lines"	Art encounters	Qualitative study; narratives of written assignments (personal and professional reflections)
9	Kenny et al. (2015). Becoming an educator in and through the arts: Forming and informing emerging teachers' professional identity.	Ireland	Music, drama, visual arts	Arts education module with the aim of re-engaging the student with art forms, making, performing and responding to the art forms	Arts education	Qualitative study; written reflections, focus group interviews
10	Leonard and Odutola (2016). "I am artistic": Mixed-method case study research of preservice generalists' perceptions of arts in education.	USA	Dance, drama, music, visual art, storytelling	Arts in Education course localised in an "Arts Lab Classroom" Includes children	Arts in education	Mixed-method case study (quantitative and qualitative data); questionnaires, portfolios
11	McCormick Davis (2005). Developing reflective practice in pre-service student teachers: What does art have to do with it?	USA	Glazed clay tiles, images, metaphors and multiple mediums (cardboards, game cards, use of colours, etc.)	Three arts integration activities, used across cohorts Centred on metaphors and personal timelines	Arts as a tool, arts integration	Qualitative study; field notes, written reflection, internet discussions, assigned papers
12	Morin (2000). Awakening aesthetic inquiry within: The making of an inquiry-driven teacher education program.	Canada	Music, dance, movement, soundscapes, drama, improvisation, visual arts, role play, drama, script writing, costuming, set design, etc.	Music and movement course "Ourselves as learners" Centred on the theme "Rivers"	Aesthetic modes of inquiry	Qualitative study; written responses to course assignments and experiences
13	Ogier and Ghosh (2018). Exploring student teachers' capacity for creativity through the interdisciplinary use of comics in the primary classroom.	UK	Comics; drawings, text/literacy, figures of large-scale materials	Comic-based module Includes pupils	Learning in and through arts	Qualitative study; voice recordings of group discussions
14	Ogden et al. (2010). Authentic arts-based learning in teacher education: A musical theatre experience.	Canada	Music, dance and drama, sounds, costumes, make-up, etc.	Musical theatre production "All I really need to know I learned in kindergarten" Includes audience	Arts-based learning, authentic arts-based pedagogy	Qualitative phenomenological study, observation, post-questionnaire, post- focus group interviews
15	Patterson (2017). Too important to quit: A call for teacher support of art.	USA	Visual arts, focusing on drawings	A hands-on art methods course "Children's	Art education, arts integration	Quantitative and qualitative data; entry- and exit-survey with open-

(*continued on next page*)

Table 1 (*continued*)

	Articles (N = 19)	Country	Arts/aesthetic elements	Type of course, activity, etc.	Expressions	Methods/data
				development in visual expression"		ended questions, drawings (before and after)
16	Pool et al. (2011). Arts integration in teacher preparation: Teaching the teachers.	USA	Artwork (painting), photos, narratives, shapes and collage	An interdisciplinary lesson on geometry, based on an "Artful Learning" model and related to multiple intelligence theory	Arts integration, arts-based pedagogy	Qualitative action research study; student teachers' lesson plans, reflective prompt responses
17	Shockley and Krakaur (2021). Arts as the core: Considerations of cultural competence for secondary pre-service teachers in the age of common core and the every student succeeds act.	USA	Theatre, live action play, visual arts, metaphors, use of colours, engaging in an art form of choice	Arts integrated course Hybrid course with the aim of developing creative pedagogical skills and cultural competence	Arts integration, art-rich experiences, arts-based teaching and learning	Qualitative study; written reflections from course assignments and online discussion posts
18	Selkrig and Bottrell (2009). Transformative learning for pre-service teachers: When too much art education is barely enough!	Australia	Drawing, print making, painting, sculpture, multimedia exploring materials such as clay, charcoal, graphite and acrylics, performing arts (not a focus of this particular study)	A learning discipline of visual and performing arts A variety of learning and teaching approaches involving the arts	Education in and through the arts, arts in education	Qualitative and quantitative data; formal and informal evaluations, journal entries, works produced by students
19	Watson (2018). Deferred creativity: Exploring the impact of an undergraduate learning experience on professional practice.	UK	Visual arts	Creativity and learning module Including interactive sessions and practical workshops at a "Visual Arts Centre Studio"	Art-based learning experience	Qualitative study (action research); questionnaires, semi-structured individual interviews, focus group interviews

multifaceted.

The umbrella term arts-based teaching and learning also mirrors Bamford's (2006, p. 11) expression "education through the arts", which embraces the use of arts as pedagogical tools employed across curricula or as integrated phenomena in general education. However, the idea of using arts as a "model" or as "tools" in this way can be further illustrated in the words of Jonathan Barnes and Ian Shirley (2007, p. 169):

> The Arts are important disciplines in themselves, but combined Arts also offer tutors, students, and pupils inspiring entry points to understanding other subjects. If the Arts are meaning-makers, then their sensitizing power can be used to enrich and engage in non-Arts subjects across all age groups.

Drawing on similar understandings, most of the studies in this review focus on arts and aesthetics as interdisciplinary phenomena, while some emphasise basic artistic abilities and knowledge about the arts. Therefore, in this review, we do not focus on isolating arts and aesthetics as matters of arts disciplines but on perceiving them as a variety of approaches to teaching and learning, with relevance for education in general.

We address the research question: *What characterises student teachers' learning outcomes in various teacher education courses that emphasise arts-based teaching and learning?* To be clear, we do not strive for characteristics that fit a traditional view on learning outcomes, often associated with input, output and measurement, that is, learning outcomes as predefined and isolated end results of learning processes. Instead, we refer to learning outcomes as emerging during the learning process, where the students themselves perform active roles in detecting their learning and its direction (Prøitz & Nordin, 2020, pp. 646, 656). As a PhD candidate and a teacher educator at a university in South-Eastern Norway, we write this review to gain an in-depth understanding of the topic, which could contribute to our further research and the improvement of the development of similar courses offered in our own institution.

The researchers' interpretations of their empirical studies' findings are coded inductively through a qualitative content analysis (Hsieh & Shannon, 2005) and categorised into three emerging patterns. These patterns are then validated and discussed through Laurel Richardson's (2005, p. 963) "crystallisation" metaphor in an effort to search for "missing angles" and "hidden refractions". The reason for using this metaphor is to mirror the complexity of arts-based teaching and learning, which appears difficult to capture through fixed sizes and rigid measurements. Thus, we strive for meaningful coherence (Tracy, 2010, p. 848) while exploring arts-based teaching and learning in teacher education.

2. Method and analysis

The study's method is inspired by arts-based educational research, whose purposes are to enhance perspectives and explore new ways of viewing educational phenomena. To explore arts-based teaching and learning, we have therefore emphasised a metaphor that enables the readers to experience what it expresses (Barone & Eisner, 2006, pp. 96–97). However, before describing the crystallisation metaphor, we need to elaborate on our literature search strategy, the selection process (Pautasso, 2013; Randolph, 2009) and our analytical approach (Hsieh & Shannon, 2005) while discovering patterns and categorising them.

2.1. The literature search strategy

The process of writing a systematic literature review started in the autumn of 2020 and was completed in February 2021. The systematic search (Pautasso, 2013; Randolph, 2009) was conducted in ten databases, using the following five basic steps of the selection process:

1. Preparing search strings,
2. Conducting searches,
3. Screening and excluding,
4. Full-text reading and
5. Selecting articles for synthesis.

After the preparation, the final search was conducted in

September 2020. The electronic databases included ERIC, Web of Science, Scopus, PsycInfo, Social Science (ProQuest), Music Periodicals Database (ProQuest), Oria, Norart, DDF and SwePub. The searches were limited to peer-reviewed journal articles that were published over the period 2000–2020. Two broad search strings were developed and combined with AND, as follows:

1. (Learn* OR teach*) NEAR/3 (art OR aesthetic*)
2. (Teacher) NEAR/1 (student* OR candidate* OR educat* OR preservice)

We made them broad to ensure that we approached the international research field widely and did not overlook relevant articles. However, the characters and the abbreviations varied among the databases, so we had to make several adjustments during the search process. Thus, in the Scandinavian databases (Oria, Norart, DDF and SwePub), we used alternative query strings by focusing on the interdisciplinary concept "aesthetic learning processes". We also combined our search strings with suitable words in the scholarly tradition of each country and in the accepted formats of each database. Eventually, the searches generated 2545 articles. After removing duplicates, the number was reduced to 1296.

The next phase involved screening titles and abstracts, and the inclusion criteria were narrowed and defined precisely. We were looking for articles dealing with (1) the context of generalist teacher education, (2) student teachers, where most of them had no background in arts education, (3) an interdisciplinary or broad perspective on arts and aesthetics and (4) empirical studies. The articles focusing on education in specific arts disciplines; primary, elementary, secondary or high school; kindergarten; special education; arts-based research; aspects of sociology (race, language, bilingualism, etc.); museums; non-empirical studies and didactics in specific subjects (math, English, etc.) were therefore excluded.

After screening the 1296 articles, 146 remained. In the second screening, the number was further reduced to 49. Thereafter, the articles were exported to NVivo for full-text reading and coded into broad categories based on their aim and focus, as follows:

1. Pedagogical learning outcomes,
2. Personal and professional identities,
3. Reflection through arts and aesthetics, and
4. Description of aesthetic education.

2.2. Selection and analysis

Addressing the topic of teaching and learning for the 21st century, we found the first category, "pedagogical learning outcomes", particularly relevant since many articles mention implications for teacher education in this century. The articles also present student teachers' learning outcomes, describing their ideas, thoughts and reflections about pedagogy and their future practice. In contrast, the second category centres on personal and professional identities and indicates few implications for future practice. However, we added one article from this category, which emphasises student teachers' experiences with arts and their future practice. Additionally, the third category, "reflection through arts and aesthetics", comprises three relevant articles that touch on student teachers' thoughts about future practice, although they specifically focus on reflection. The three articles were therefore included in the synthesis. The articles under the fourth category have more general descriptions of aesthetic education and do not discuss learning outcomes to the same degree. In addition, all categories include some articles that focus on other topics, and the aesthetic perspective is less prominent. Therefore, we excluded them in the synthesis.

We started to re-read these mentioned articles and to write an overview of basic information, such as contexts, backgrounds, research questions, purposes, theoretical concepts, methods, findings, discussions and other supplementary comments. We then narrowed the sample by selecting the articles that describe specific courses, seminars, projects or modules that involve arts-based teaching and learning in teacher education. As a result, the sample was reduced to 19 articles, which were included in the synthesis (see Fig. 1).

After the selection, we conducted a qualitative content analysis (Hsieh & Shannon, 2005, p. 1279), where the coding and the categories emerged or flowed from the data. Specifically, instead of using a theoretical lens, we approached the data inductively and immersed ourselves into the interpretations of multiple researchers and their first-hand experiences in the research field. We searched for prominent patterns and divided them into three categories.

While working with the categories, at this phase, we were concerned about conducting a systematic analysis by emphasising similarities and connections. However, as we discovered tensions and contradictions within the categories, we found the crystallisation metaphor helpful in preserving the complexity that these patterns seemed to mirror. We therefore came up with the idea of creating a "crystal" of student teachers' learning outcomes, based on the multiple "angles" in these empirical studies.

2.3. The crystallisation metaphor

Richardson's (2005, p. 963) crystallisation metaphor is often used in qualitative research, with the aim of providing an in-depth and complex understanding of issues, as it implies multiple approaches to interpreting and describing the world (Tracy, 2010, pp. 843–844). As crystals are altered prisms that combine "symmetry and substances", as well as "transmutation, multi-dimensionalities and angles of approach", they "reflect externalities and refract within themselves" (Richardson, 2005, p. 963). In other words, as light rays penetrate different angles of a crystal, they create colours, patterns and arrays that surge in different directions. The researchers can thus search for "refractions" within their own research. Additionally, since all knowledge is developed through "an angle of repose", the researchers should doubt what is known and realise that "there is always more to know" (Richardson, 2005, p. 963).

The crystallisation metaphor works as a way of preserving the trustworthiness, verisimilitude and plausibility of research findings. It then requires the researcher to access multiple data sources, use several methods and theoretical frameworks and collaborate with multiple researchers (Tracy, 2010, pp. 843–844). Therefore, in this literature review, we have chosen to use the crystallisation metaphor as an approach to interpreting our research findings. This implies that we approach the literature review as a combination of multiple perspectives from different research processes. In these processes, several researchers have produced multiple data sources and the findings are interpreted using different theoretical perspectives. Considering this multifaceted approach, we do not discuss research biases but emphasise how these studies, as angles of our crystal, contribute to creating a multi-dimensional perspective.

By using the crystallisation metaphor, we aim to validate our review and create an overview of the research field. To be more precise, we use this metaphor as we do not attempt to describe a single truth of student teachers' learning outcomes in these courses but to shed light on how they are made visible as different patterns with inherent complexity. To do so, we imagine how light rays are

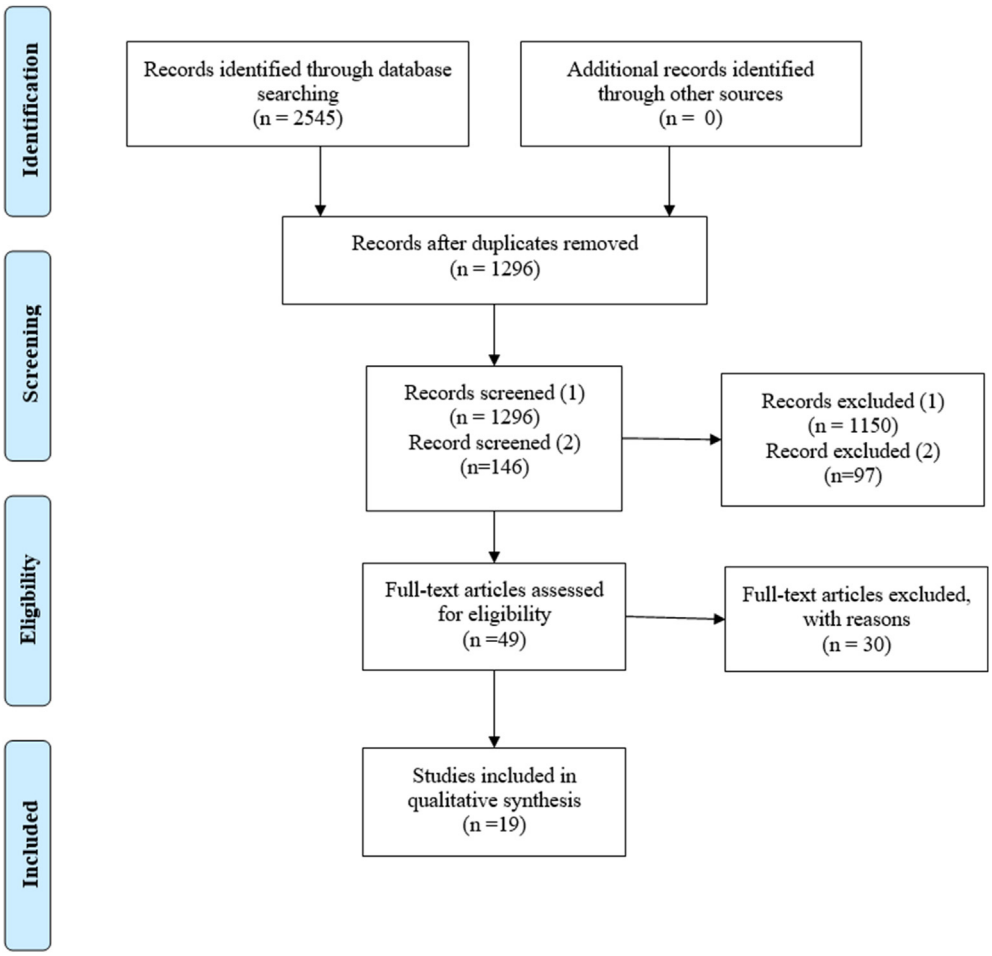

Fig. 1. Prisma flow diagram – selection process.

refracted through the multiple angles of a crystal, creating unique and multifaceted patterns (also called colours or arrays). As a result, we may discover that we miss several angles in the research field and that some refractions might be hidden.

We argue that the crystallisation metaphor creates meaningful coherence (Tracy, 2010, p. 848), while examining the research field of arts-based teaching and learning. The research field appears in its own nature as a complex field without exact formulations or conclusions. As the research field exists at the crossroads of arts education, didactics and pedagogy, it simultaneously represents multiple contexts, purposes, theories, analyses and argumentations. A descriptive overview of the articles shows the broad coverage of the studies and their differences.

2.4. Descriptive overview

The articles included in the synthesis describe empirical studies whose primary sources are qualitative data. However, quantitative data, such as those obtained from surveys, are also reported. The qualitative data sources comprise, among others, research interviews, evaluations, assignments, written reflections and artworks. They show a clear dominance of student teachers' reflections and self-reported data. Additionally, the articles are often written by researchers close to the research field. To illustrate, many of the researchers are the teachers themselves in these courses.

Throughout the articles, expressions and theoretical perspectives vary. As mentioned, the studies use different expressions to describe these approaches, for example, “arts”, “arts integration”, “aesthetic education”, “arts-based approaches/practices”, “estetiske virkemidler” (Norwegian) [aesthetic elements/tools], “authentic arts-based learning”, “education ‘in and through’ the arts”, “aesthetic inquiry”, “arts-based learning experience” (see Table 1). Several studies focus on creativity, while others refer to other concepts, such as imagination (Greene, 1995), transformative learning (Mezirow, 1997), experiences (Dewey, 2011), multiple intelligence (Gardner, 1999).

The articles refer to different designations of student teachers, and the teacher education programmes' organisations and levels vary. For example, some courses (as described in these teacher education programmes) include children and pupils in schools, while others centre on student teachers and educators in universities/higher institutions. Additionally, the compositions of the groups differ among the various teacher education programmes. Nevertheless, most of the students have no formal arts education, and many students lack arts experiences beyond their own time as pupils in school.

3. Patterns

During the analysis, three patterns emerged from the articles. The patterns are recognisable as empirical claims, expressed both explicitly and implicitly. Naturally, some patterns are covered to a larger extent in some articles, and there are also contradictions

among the studies. Intending to answer the research question (What characterises the student teachers' learning outcomes in various teacher education courses that emphasise arts-based teaching and learning?), the findings are categorised under the following patterns: (1) *emotional turns* (2) *ability and desire to act* and (3) *changed attitudes.*

In the following sections, we use the terms "student teachers" and "students" (instead of preservice teachers, teacher candidates, etc.) and "courses" (instead of seminars, modules, projects, etc.). As mentioned, we also refer to "arts-based teaching and learning" as a common phrase that includes the various approaches of art forms and aesthetic elements that are represented in the studies. In general, these adjustments are made to make the patterns more readable and the research field more comprehensive. Aiming for transparency, we refer to some examples illustrating the analytical process at the end of each pattern.

3.1. Emotional turns

According to the researchers' interpretations, most of the student teachers seem to have little or no background in the arts. Before and at the beginning of the courses, they convey a general scepticism or resistance towards courses that emphasise arts-based teaching and learning. In some studies, the scepticism is expressed explicitly through empirical claims, which some of the researchers identify as various barriers, including uncertainty (Davies, 2010, p. 633), fear (Barnes & Shirley, 2007, pp. 171, 173; Selkrig & Bottrell, 2009, p. 400), anxiety, nervousness (Ogier & Ghosh, 2018, p. 302; Patterson, 2017, pp. 344–345), discomfort (Morin, 2000, p. 15) and anger (Patterson, 2017, p. 343). According to Patterson's (2017, pp. 344–345) research, student teachers' initial reactions to art activities during a "hands-on art methods course" generally "varied from slight nervousness to outright terror". Patterson (2017, pp. 344–345) describes these emotional reactions as fear of making mistakes and inadequacy compared with the other participants. The anxiety also seems to stem from a sense that the students lacked subject knowledge. Likewise, Selkrig and Bottrell (2009, p. 400) refer to a "visual and performing arts course", where a discussion, centred on the assessment of the student teachers' artworks, evoked pure fear and dread. The researchers report that many student teachers have reservations about the arts, and descriptions such as being "extremely apprehensive" and "initially very nervous about the task" are therefore common at the early stages of arts courses.

Uncertainty, challenges or concerns about open-ended processes (Barnes & Shirley, 2007, p. 171), alternative pedagogy (Selkrig & Bottrell, 2009, p. 405), creative tasks (Ogier & Ghosh, 2018, p. 302) and risk-taking (Ogden et al., 2010, p. 374) are additionally recognisable. For example, Barnes and Shirley (2007, p. 171) show the student teachers' uncertainty about what would be accepted as 'right' or 'good' during an arts project involving pupils. The project's open-ended nature seems to challenge the students by making them afraid of making mistakes and taking control. Additionally, Ogier and Ghosh (2018, pp. 302–303) report that before a cross-curricular activity based on comics, the students felt anxiety and had barriers to creative, untried and innovative activities, which were already becoming entrenched in their attitudes.

However, during and after the courses with arts-based teaching and learning in teacher education, the students seemed to appreciate their experiences. To illustrate, the researchers report the dominance of positive learning outcomes and experiences with arts and aesthetics. For example, Ogden et al. (2010, pp. 379–380) claim that the students expressed immense pride in creating an authentic musical theatre production. As a result, the students gained energy and enthusiasm, experienced joy and felt alive, which the researchers recognise as a kind of vitality. The experience with musical theatre also affected other aspects of the students' lives. The researchers write, "the participants shared an overwhelming and increased appreciation for the arts" (Ogden et al., 2010, p. 379), which encouraged them to seek similar opportunities outside the educational context. The appreciation for these experiences followed the students into their personal sphere and into informal contexts. Likewise, the appreciation for the arts is mentioned explicitly in Leonard and Odutola's (2016, pp. 289, 295) study, which emphasises the students' positive and engaging experiences in an "Art Lab". Additionally, Briseid (2011, p. 208) refers to students using adjectives such as "exciting" and "fun" after an interdisciplinary project based on a "Living story" (translated from the Norwegian, "*Levende historie*"].

To understand why arts-based teaching and learning are described through these emotional characteristics, it is essential to point out that some noteworthy qualities are recognised in the studies. For example, these experiences are depicted as authentic (Ogden et al., 2010, p. 374), deep (Giorza, 2016, pp. 177–178), embodied (Bhukhanwala et al., 2017, pp. 618–623) and multisensory (Shockley & Krakaur, 2021, p. 19). It is also mentioned that these approaches connect teaching and learning to the world outside the classroom (Franklin & Johnson, 2010, p. 89; Giorza, 2016, pp. 177–178) and to the personal sphere of the students (Ogden et al., 2010; Selkrig & Bottrell, 2009; Watson, 2018). For example, Franklin and Johnson (2010, pp. 88–89) emphasise how student teachers with immigrant backgrounds "tapped into personal memories" in the context of a theatre performance and a pre-performance workshop. Citing another example, Jovè and Farrero (2018, p. 342) highlight how contemporary art provided students with both personal and professional reflections. The link to the personal sphere is also expressed more indirectly, for instance, in Bhukhanwala and colleagues' (2017, p. 623) study, where they recognise how arts-based activities, centred on an embodied theatrical dialogue, made student teachers reflect on their beliefs, thoughts, feelings and assumptions. Thus, the authors (2016, p. 627) recall the student teachers' experiences through arts-based activities as facilitators of vulnerability, risk taking and critical incidents, which provided deep, intimate and transformative learning.

In sum, the student teachers' learning outcomes in courses that emphasise arts-based teaching and learning seem to be characterised by a wide range of *emotions* – from fear, nervousness and uncertainty to excitement, joy and the feeling of appreciation. This implies that the unknown, risk-taking, open-ended and alternative learning process challenges the students emotionally. However, as a paradox, it also creates experiences that are appreciated due to their authenticity, depth and connection to personal spheres. Based on this interpretation, we recognise the tension between emotional contradictions that create both barriers and challenges. We also notice that many teacher education contexts manage to create meaningful connections between these emotional contradictions that lead to dynamic forces and student teachers' *emotional turns* (see Table 2).

3.2. Ability and desire to act

As mentioned, many student teachers erected barriers to arts-based teaching and learning before and at the beginning of their courses. They also seemed to lack the confidence to practise the arts. In this regard, Patterson (2017, pp. 346, 350) highlights how misconceptions among student teachers made it difficult to believe in their own skills and abilities. In an entry survey (before the art course), 79% of the students in this study believed that people were

Table 2
Examples of some empirical claims from two articles, sorted and processed in the analytical process (see Table 1 for the titles). Bold font is used for emphasis.

Articles	Barriers/challenges	Appreciation/changes	Qualities
14 Ogden et al. (2010)	"many of the participants discussed the **challenges** involved in the experience" (p. 374); "at the beginning, participants described confidence and risk-taking as areas of **concern**" (p. 374)	"experiences had affected **other aspects** of their life" (p. 378), "shared an overwhelming and **increased appreciation** for the arts" (p. 379); "nearly all cast members commented that they gained **energy, enthusiasm,** and **joy"** (p. 379)	"the **authenticity**, or **realness** of the musical theatre experience was a central theme for many participants" (p. 374); "arts-based learning can impact teacher candidates in both **professional and personal** ways" (p. 379); "we describe these qualities as **vitality**" (p. 379)
15 Patterson (2017)	"varied from slight **nervousness** to outright terror" (p. 344), "angst about art as a result of a variety of **issues**" (p. 344), "**fear** of making mistakes or feeling inadequate compared to their peers" (p. 344), "stated they were downright **fearful** of art" (p. 345)	"anger/anxiety eventually **shifted into positive** learning outcomes" (p. 346)	"the **hands-on process** is necessary, the act of the experience, rather than the knowledge of a theory" (p. 346), "**emotionally** charged task" (p. 346)

born with artistic abilities. However, Patterson shows that these misconceptions changed during the course, and in the exit survey, none of the students thought that these were true anymore. Instead, they understood that the inability to draw could be addressed by working on visual skills. Similarly, Kenny et al. (2015, pp. 163–164) report that student teachers turned away from pre-existing assumptions about the need for people to be "talented" in the arts through practical 'hands-on' experiences. Many researchers also emphasise how students increased their confidence in their own artistic abilities (Barnes & Shirley, 2007, p. 173; Davies, 2010, pp. 633–634; Hunter-Doniger & Herring, 2017, p. 287), discovered aesthetic abilities that they did not know they had (Morin, 2000, p. 16) or developed sensitivity towards arts that provided both confidence and skills (Selkrig & Bottrell, 2009, p. 295).

The abilities to perceive new and creative solutions to solve problems (Shockley & Krakaur, 2021, pp. 32–33), capture pupils' interests (Briseid, 2011, p. 211), become aware of "others" in a more multi-dimensional way (Franklin & Johnson, 2010, p. 93) and engage in perspective-taking (Bhukhanwala et al., 2017, p. 627) and authentic learning experiences (Hunter-Doniger & Herring, 2017, p. 288; Ogden et al., 2010, pp. 374–375) are examples of skills mentioned as outcomes of the courses. To illustrate, Shockley and Krakaur (2021, pp. 32–36) refer to how the student teachers in their study discovered the opportunity to connect to the students' interests, perspectives and ideas in the classroom by using art as a cultural resource. The researchers claim that responsiveness to diverse learners in classrooms seemed to occur through the experiences.

In this regard, the students in teacher education have started to develop thoughts and ideas about their future practice as teachers, which open possibilities for actions. For example, McCormick Davis (2005, p. 17) claims that art activities provoked direct ideas for students' future practice. Briseid (2011, p. 207) additionally refers to a kind of transfer value noticed by the students, implying that they recognised the opportunity to think and teach untraditionally in their future practice. Similarly, in Ogier and Ghosh's (2018, pp. 293, 303) study, after the students' experience in interdisciplinary work with comics as a way of learning through the arts and developing creative abilities, they felt empowered to experiment with children-centred topics to inspire learning and to take creative risks. Leonard and Odutola (2016, p. 295) also note that the students gained confidence and expressed a desire to take risks in their future practice.

Such empowerment is further illuminated by Watson (2018, pp. 206–207, 212), who examines former student teachers' participation in an art-based learning experience and its impact on their professional practice. The research findings indicate that focusing on the identification and development of creative characteristics, skills and attitudes, helped the students to become more creative practitioners. By engaging in risk-taking and creative processes in a Visual Arts Centre, the former student teachers were encouraged to approach their professional practice with more creativity.

However, some challenges that could inhibit student teachers' ability to act are recognisable. For example, Leonard and Odutola (2016, p. 296) report that many students remained fearful of trying arts in their future practice. They still expressed a desire and responsibility to do so, notwithstanding the lack of time and prioritisation of standardisation and tests in schools. Likewise, Watson (2018, p. 211) emphasises that in the UK, graduate teachers often encountered challenges in practising creative tasks because they lacked support and understanding at an institutional level. Additionally, the standardised curricula and assessment practices in schools often reinforced these challenges.

Therefore, student teachers' learning outcomes in courses that emphasise arts-based teaching and learning are characterised by developing confidence and skills that create connections to their future teaching practice and empower them with the ability to act. The learning outcomes simultaneously show that the development of skills and confidence to use these approaches to teaching and learning is a challenging process affected by external conditions. We also find that misconceptions and the lack of confidence to practise arts-based teaching create tensions between intention and action. In this regard, it is not just the *ability to act* that is emphasised as a valuable learning outcome in these studies but also the development of the student teachers' *desire to act* (see Table 3).

3.3. Changed attitudes

During the students' participation in courses with arts-based teaching and learning in teacher education, most of the researchers claim (as indicated) that something seemed to "change" the students. Although these changes can naturally be related to the "emotional turns" and the expanded "ability and desire to act", they also seemed to involve other aspects related to a kind of growth, journey or process, which occurred at the already mentioned crossroads of personal and professional spheres. In this regard, arts became a kind of "provocation" (McCormick Davis, 2005, p. 17) for the students to change their perspectives and understandings.

Before and at the beginning of the courses, many student teachers seemed to show prejudice against arts-based teaching and learning. This prejudice seemed to be connected to the students' emotional reactions and misconceptions about their own skills, as already described. As previously mentioned, Ogier and Ghosh (2018, pp. 302–303) report that the students' anxiety and barriers to creative, untried and innovative activities were already becoming entrenched in their attitudes. Other researchers shed light on these issues through the students' prejudice against open-

Table 3
Examples of some empirical claims from the articles, sorted and processed in the analysis (see Table 1 for the titles). Bold font is used for emphasis.

Articles (examples)	Ability to act	Desire to act
7 Hunter-Doniger and Herring (2017)	"students strongly agreed that they were able to integrate the arts into their instructional **practice**" (p. 287); "the practicum became an opportunity to demonstrate the preservice teachers' connections between what they learned in the classroom and **what they were able to** teach in the classroom" (p. 288); "**engage** in authentic learning themselves" (p. 288)	"the course "**increased my desire** to incorporate arts into every subject as often as possible, these data demonstrate how the participants gained **confidence**" (p. 287).
10 Leonard and Odutola (2016)	"their perceptions of themselves as **being** "**artistic,**" increased from the beginning to the end of the semester (p. 286); "highlight positive change in the students' perceptions about their own **artistic abilities**" (p. 293)	"they gained confidence and **felt a desire** to take risks in the future" (p. 295); "many students admit to still being fearful about trying the arts in the future, while at the same time, expressing a **desire and responsibility** to do so" (p. 296)

ended and alternative processes (Barnes & Shirley, 2007, p. 171; McCormick Davis, 2005, p. 17) or through the students' own marginalised arts experiences from school (Kenny et al., 2015, p. 164). In McCormick Davis' (2005, p. 17) research, she claims that some students did not acknowledge these approaches due to their understanding of "children as receivers of knowledge rather than constructors". Another prejudice is also mentioned by Hunter-Doniger and Herring (2017, p. 284), who refer to how student teachers had initial problems reconciling the artistic with the academic. They emphasise that the students had to realise that arts had more rigour than they first assumed, and they had to learn that completing an arts project required knowledge, skills, effort and planning to succeed.

Similarly, the studies generally show that several changes occurred in the students' attitudes. For example, student teachers seemed to discover how arts-based teaching and learning offered the potential to engage and meet the needs of diverse learners in schools (Davies, 2010, p. 633; Hunter-Doniger & Herring, 2017, p. 288; Shockley & Krakaur, 2021, pp. 34–36). Student teachers also recognised children's ability and desire to engage in a variety of art forms and thus acknowledge the power of the arts as a motivator for learning across all curriculum subjects (Barnes & Shirley, 2007, pp. 173, 162). They developed an understanding of the relationship between the arts, creativity and cultural education (Davies, 2010, p. 633) and of knowledge as something actively created rather than passively received (Jovè & Farrero, 2018, p. 342). Student teachers also experienced arts-based approaches' capacity to create open and inclusive learning environments (Bhukhanwala et al., 2017, pp. 623–627) and recognised their ability to use multiple expressions of communication (Franklin & Johnson, 2010; Morin, 2000; Pool et al., 2011). Regarding the last aspect, the opportunities to communicate an understanding alternatively (Pool et al., 2011, p. 9) and to create a community where children can express themselves (Franklin & Johnson, 2010, p. 94) are among the mentioned reasons for emphasising multiple forms of communication. As a result of these discoveries, a changed understanding or a shift in the students' thinking emerged throughout the courses, which again triggered new attitudes towards arts and aesthetics as resources for preserving diversity in schools. Alternatively, as Morin (2000, p. 16) claims, the students realised that "learning was more about diversity than sameness".

To illustrate this point more specifically, we turn to Pool and colleagues' (2011, p. 9) research that illuminates how a new understanding arose among the student teachers while using arts as an introduction practice to a content area (in this case, geometry). In this study, the student teachers realised that arts provided alternative ways to make the curriculum accessible to a variety of learners. Likewise, Briseid (2011, pp. 213–214) reports that student teachers were motivated to use aesthetic elements as cross-curricular tools in teaching, as they experienced how these elements could connect theory and practice. Thus, the researcher concludes by illuminating how aesthetic tools or elements might have the potential to frame the more challenging academic content in school and teacher education.

However, as mentioned, the student teachers also discovered the link between personal and professional spheres in these experiences. For example, Franklin and Johnson (2010, pp. 92–94) refer to how the connection between arts and personal stories led to student reflection. In their research, a powerful theatre experience made the students reflect on their own personal stories and realise that they wanted to create a community where children could express themselves. Following these experiences, the researchers claim that the student teachers developed deep sensitivity towards children. Similarly, Giorza (2016, pp. 167, 178) refers to the link between personal and professional spheres as an "openness to our changing selves" and claims that visual and embodied forms of knowledge, explored through artworks, created a link between the "self" and the "learning self" that made the students aware of how the same processes might work for children in primary school. In Barnes and Shirley's (2007, p. 174) research, an example of these changed attitudes towards children's learning is how the student teachers started to ask questions regarding the rigidity and the structure of the curriculum in primary school.

Summarising these empirical claims, the student teachers' learning outcomes in arts-based teaching and learning are characterised by *changed attitudes*. In other words, the student teachers' changed understanding depicts new attitudes where arts and aesthetics create connections to diverse learners and become pathways for multiple communication and teaching practices. Discovering these connections seems to broaden the student teachers' perspectives on teaching and learning. We therefore find a tension between prejudice and ingrained negative attitudes towards arts and aesthetics, on the one hand, and openness to embracing their possibilities, on the other hand (see Table 4).

4. Discussion and implications: creating a crystal of angles and refractions

In the preceding section, we have presented student teachers' learning outcomes in courses that emphasised arts-based teaching and learning, which created the patterns of emotional turns, ability and desire to act, as well as changed attitudes. We have further described how each of these patterns illuminated tensions and connections within themselves. To illustrate these, we have recognised tensions and connections across a wide range of emotions, including fear, uncertainty, nervousness, excitement and joy. Specifically, a majority of the students advanced from fear and uncertainty to the feeling of appreciation and engagement. At the same time, some of these contradictions seemed to work in parallel in different phases. We have also found that the student teachers' learning outcomes created connections to their future practice but simultaneously involved tension due to their lack of confidence and

Table 4
Examples of some empirical claims, sorted and processed in the analysis (see Table 1 for the article titles). Bold font is used for emphasis.

Articles	Pre-attitudes	Changed attitudes
12 Ogier and Ghosh (2018)	"anxieties and barriers that were already becoming **entrenched in their attitudes** towards trying innovative and untried, creative methods of working" (p. 302); "worried about behaviour issues" (p. 302); "the students' **pre-project attitudes** were uncertain about what forms of literature were actually legitimate for teaching" (p. 302); "it would be a risky thing to do: that it might leave him open to **criticism** from other teachers" (p. 303)	"questioned his own **philosophy** of what kind of teacher he wanted to become" (p. 304); "gain an **understanding** of the children and an **insight** into their lives" (p. 304); "the opportunity to take risks within their teaching enabled the students to gain an insight" (p. 305); "**self-perceptions** of their identities as new teachers, and their ability to critically view the needs of the children they will teach" (p. 306)
16 Shockley and Krakaur (2021)	"most of the pre-service teachers **had not considered** art integration and certainly not as the pedagogical practice that this study employs, that is, to integrate into a culturally responsive space or for diverse learners" (p. 16); "arts integration offered a way to reflect on interest and skill that **they had not previously considered**" (p. 17)	"pre-service teachers **shifted their perspectives** and embraced creative solutions" (p. 20); "the teacher candidates' perspectives **morphed in new ways** by considering more creative options, to either lead or help lead students or their schools" (p. 14); "including arts as culture, offer opportunities for teacher candidates to **uncover new ways of thinking** that did not occur in their field experiences, their methods courses, their research courses, or their cultural competence courses" (p. 20)

skills. Based on this tension, student teachers' desire to act is also emphasised as a valuable learning outcome in some studies. Lastly, while describing their changed attitudes, the student teachers experienced tension due to their prejudice against and misconceptions about arts and aesthetics. Through the courses, the students also discovered how these approaches were connected to children's learning, as well as diversity in schools and classrooms, since these opened multiple ways to communicate and teach.

As shown, the tensions and the connections described in each pattern have several internal contradictions within themselves. There are also no clear distinctions between these patterns since they seem to be consistently connected to each other in different ways. Specifically, student teachers' emotions will naturally affect their actions and attitudes, just as their attitudes and actions will influence how they feel about arts-based teaching and learning. Therefore, we do not perceive these patterns as isolated, fixed or static "objects" or "points" but as patterns of an altered, growing and multifaceted wholeness. This means that these interpretations represent "substances and symmetry" but simultaneously involve what Richardson (2005, p. 963) notes as "a variety of shapes, substances, transmutations, multidimensionalities, and angles of approach". By picturing student teachers' learning outcomes as forming a crystal in this way, we aim to validate these research findings by emphasising complexity.

As we also attempt to use the metaphor as an approach to identify research gaps and draw implications for further research, we have noticed that several angles might be missing in our crystal, as well as "refractions" that might be "hidden" (Richardson, 2005, p. 963). For example, the studies in this review do not differ significantly in their research designs, as the data are often self-reported through interviews, surveys or reflection notes. Additionally, the time spent in the research field is often (and naturally) limited, as many of the studies are recognisable as small case studies. By emphasising Richardson's (2005, p. 963) notion of how research describes a partial understanding, where "what we see depends on our angle of repose", other forms of data, such as observation or video data, as well as a longer time perspective in the research field, could be supplementary angles in order to create valuable knowledge.

We have also noticed that several "hidden refractions" create these patterns of emotions, actions, intentions and attitudes, which could be further investigated. For example, we wonder why these initially fearful, emotional reactions are such prominent patterns in the context of teacher education and what they express. Although many studies try to identify the reasons, such as lack of arts experiences (Patterson, 2017), fear of taking risks (Ogier & Ghosh, 2018) and discomfort about open-ended tasks (Barnes & Shirley, 2007), we can only assume their underlying causes. For example, could it be the understanding of the arts in a certain culture or more general structures in the educational systems that somehow influence these emotional patterns? Similarly, as authentic (Ogden et al., 2010), first-hand experiences (Patterson, 2017) with arts and aesthetics seem necessary in changing these fearful emotions into appreciation, these "emotional turns" may constitute an unexplored aspect of learning through arts and aesthetics. In other words, it might be the qualities of these experiences, processes and expressions that create these changes. At the same time, it might be the activities that involve practical experiences, collaboration or untraditional teaching that appeal to the students. Based on our interpretation of the materials in this review, it is difficult to separate the qualities of these teaching methods from one another.

Another example of these hidden refractions is the tension between the students' ability and desire to act. We have learned that many students felt empowered to act (Briseid, 2011; Ogier & Ghosh, 2018,) after taking these courses and would engage in arts-based teaching in their future practice but were simultaneously fearful (Leonard & Odutola, 2016). The lack of support from educational institutions, marginalisation of the arts, external pressures that focus on results, and a standardised curriculum (Kenny et al., 2015; Leonard & Odutola, 2016; Watson, 2018) are other examples that shed light on the challenges that student teachers could encounter when they graduate. However, if teacher education programmes aim to prepare and equip student teachers with suitable and sufficient skills, which enable them to facilitate arts-based teaching and learning in their future teaching practice, we need more in-depth knowledge on the elements and the contexts that interact in creating tensions and how systematic courses and assessment practices contribute to these issues. We thus need to expand the knowledge regarding how elements, such as time, space, resources, types of activities, among others, interact in developing this ability to act.

Prejudices against and misconceptions about arts and aesthetics existed (Barnes & Shirley, 2007; McCormick Davis, 2005; Ogier & Ghosh, 2018). During the courses, the students discovered how these approaches could create connections and communication with diverse learners (Pool et al., 2011; Shockley & Krakaur, 2021). We have noticed that some studies (see Table 1) describe courses that include children and that these experiences seem to be fruitful ways of developing attitudes supporting arts-based approaches. Considering this, these experiences with children highlight the importance of practice and authentic teaching experiences in teacher education. These experiences may also signify a crucial point to break free from misconceptions and prejudices concerning arts and aesthetics. We still have no foundation to claim anything

about the differences in learning outcomes regarding whether children are included or excluded because we have not explored this systematically. However, this could be one of several interesting "hidden" refractions that could help us enhance our understanding of student teachers' learning outcomes in these courses. In this regard, we also wonder how tensions develop based on the students' social backgrounds, gender, experiences with arts and aesthetics, among others, or how their various attitudes influence their teaching practice and interactions with children. Additionally, we seek more knowledge on the misconceptions and the prejudices about arts that are made visible. Although there are several elements in the studies that could illuminate these aspects, for example, in the study by Kenny et al. (2015, p. 164), where the student teachers' own marginalised school experiences are seen in connection with how they valued arts in teaching, we still argue that more research on misconceptions and prejudices could make teacher educators more aware of how students' own school experiences with arts, myths about arts or the narrow scope of curricula influence their learning.

In general, the studies seem to be dominated by exclusively positive descriptions of how the courses create changes in emotions, actions, intentions and attitudes, which resolve some of the tensions that come into view. For example, some researchers emphasise how the students are being transformed through their participation (Bhukhanwala et al., 2017; Patterson, 2017; Selkrig & Bottrell, 2009). To be clear, we do not question the studies' trustworthiness or quality. Instead, we wonder if many "angles" in this research field mirror "unspoken truths" and what arts could achieve in educational contexts. As a contradiction, it would have been refreshing to read studies that depict learning outcomes characterised by unresolved tensions and small degrees of change in student teachers' perceptions. We believe that this perspective could contribute to the research field and create different patterns, which could offer valuable insights and an extended understanding of tensions in these contexts. In other words, we may learn something about whether and why a course moves in the wrong direction and creates unsatisfactory learning outcomes.

These missing angles and hidden refractions in our crystal of student teachers' outcomes shed light on implications for further research. By focusing on the key issues described in this section, we seek to gain more in-depth knowledge of how tensions and connections in emotions, actions, intentions and attitudes develop and are expressed, which will include more variations in data sources and a longer time perspective. If changes in emotions, actions, intentions and attitudes are premises for these approaches to succeed in teacher education, we need to expand our knowledge of how teacher education could integrate them as valuable learning outcomes. This point addresses a discussion on what is understood as valuable knowledge that a future teacher should possess and be rewarded for.

Although we have increased our knowledge on this topic, our literature review has several limitations. For example, we have narrowed the sample to a small size with a particular focus, which describes some learning outcomes of these courses. Nevertheless, there might be other studies that could supplement our analysis and create a broader picture. For example, the categories that focus on identity and reflection could contribute to existing knowledge by describing other learning outcomes and using different research focuses and perspectives. In this regard, we have noticed that reflection is a recurrent topic that permeates the descriptions of how these learning outcomes emerge and are recognised. However, as student teachers' reflections (expressed in notes, interviews, portfolios, etc.) constitute the most prominent data source in this review, it seems artificial to regard reflection as an independent learning outcome. Instead, we emphasise that reflection is a huge part of these learning processes that influence the student teachers' range of emotions, actions, intentions and attitudes. Not least, the different contexts of countries, institutions, teacher education programmes and cultures, as well as the various groups of students, teaching methods, art forms and aesthetic elements of these courses, make it artificial to describe a common pattern of learning outcomes. Bearing this point in mind, our experiences from this review process reflect the difficulties, challenges and crossroads in making choices as researchers. In this regard, we hope that the transparency in our presentation of patterns and the metaphor of crystallisation, reflecting complexity, have preserved the trustworthiness of this study.

5. Concluding remarks

To conclude, we argue that teacher education programmes need more knowledge on how to prepare student teachers for the unknown future (Bedir, 2019; Darling-Hammond, 2006). Globalisation and unpredictable changes (Robinson, 2010) force rethinking about teacher education contexts worldwide. Based on our argument, we believe that the emphasis on arts-based teaching and learning that open opportunities for diversity, creativity and risk-taking offers a pathway towards this goal. However, crystallising the various interpretations from the research field shows that developing student teachers' ability to facilitate arts-based teaching and learning is a challenging and complex matter. We also conclude that arts-based teaching and learning have epistemological implications and possibilities that could expand what is recognised as valuable learning outcomes in teacher education. Changed emotions, intentions and attitudes may not be traditional learning outcomes in teacher education. However, drawing on this interpretation, they emerge as significant, powerful and real learning outcomes.

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