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Pre-service teachers and conceptions of intelligence in the Scottish context: challenging a unidimensional view

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ABSTRACT

This exploratory study aimed to investigate the implicit (personal theories) of student teachers through consideration of their beliefs about the nature of ability (intelligence). By drawing on ideas of personhood and identity to investigate constructions of intelligence, the authors also hoped to begin to explore the legitimacy of a multifaceted notion of individual accounts of ability. A questionnaire was administered to student teachers undertaking a one-year intensive postgraduate diploma in order to become high school teachers ($n = 46$) (12–18 years) or primary teachers ($n = 41$) (3 up to 12 years). Findings highlight the ways in which these student teachers held contrasting views of intelligence depending on their positioning and the implications for teaching decisions and children's learning experiences.

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KEYWORDS

Intelligence; pre-service teachers; learner abilities

1. Introduction

Ability or intelligence¹ concepts lie at the heart of teacher and child experiences of any education system, and ability constructs are part of individual narratives, captured by teacher beliefs about teaching and learning, predisposing them to make decisions about young people that may shape future lives (examples of the ongoing nature of this topic: Blackwell, Trzesniewski, and Dweck 2007; DeFrates-Densch et al. 2004; Hart et al. 2004; Jones et al. 2012; Lynott and Woolfolk 1994; Swann et al. 2012). Experiences in classrooms are usually framed by ability decisions, whether in the form of reading or maths groups within classes, or within more formal and segregated provision such as setting (in the UK) (key authors: Boaler, Wiliam, and Brown 2000; Hallam and Ireson 2007; Hallam and Parsons 2013) or tracking (in the USA) (Gamoran 2009; Oakes 2005) where subject-specific judgments are used to separate children into different pathways through the education system. Sadly, they may rarely move out of these prescribed routes (Hamilton and O'Hara 2011). Consequently, there is a need to ask to what extent ability is problematised and challenged for/by teachers, particularly during the initial preparatory phase in Initial Teacher Education (ITE). The focus of this article, therefore, is on the ways in which student teachers understand and use concepts of intelligence/ability during a one-year

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postgraduate ITE course. Building an exploratory study, we set out to create an original framework for considering student teacher conceptions of intelligence and to establish a preliminary foundation for further work.

Importantly, intelligence is not seen by the researchers as singular but instead is seen as potentially multifaceted, depending upon the positioning of the student teacher. The latter is based upon an adapted version of Harre's ideas of personhood (Hamilton 2002) and asks student teachers to consider how they construct the abstract idea of ability (looking outwards), how they perceive their own and others' perceptions of their abilities (self-perception and perception of others' views) and how they apply concepts of ability to young people in their classrooms (outward application for others). However, firstly, it was necessary to review what is known about teacher ability judgements and why ITE might be a particularly salient point to investigate beginning teachers' ideas about ability and the application of these ideas to young people in their classrooms. During this article we draw on older texts either to show the ongoing nature of these issues or to highlight authors who have contributed important texts on the subject. We also make use of many texts from the second decade of the twenty-first century.

2. Ability judgements and ITE

2.1. Teachers constructing ability/intelligence

Teacher constructs of intelligence have often been seen as inconsistent, easily swayed by superficial characteristics and sometimes contradictory (examples over an extended period: Thomson, Ward, and Stewart 1995; Buehl and Beck 2014; Gear 1976; Gutshall 2014; Hamilton 2002; Jones et al. 2012; Maltby 1984; Richert 1991; Thomson, Ward, and Stewart 1995), and yet the accuracy of teacher judgements within classrooms is not often questioned or challenged strongly in mainstream debate concerning the achievement of learners (White 2006). The impact of teacher judgements on children's self-esteem and self-efficacy can be far reaching, as examples from Reay and Wiliam highlight (1999) and in Hamilton's previous work (2011; Hamilton and O'Hara 2011). The negative consequences of such judgements can be seen in the ways that children internalise ability judgements and in the ways that they can use them to shape a particularly damaging sense of self. Reay and Wiliam's article (1999) entitled 'I'll be a nothing' highlighted the danger of standardised testing and the implicit messages given to children by such measures in primary schools in England. Hamilton's work on ability judgements 2002 in diverse school types argued that as long as the currency of the classroom is focused on ability measurement, then children may focus on a graded or numerical sense of self, especially as high-stakes testing becomes more prominent in the later years of high school.

The dominance or even tyranny of ability constructs is still very much the norm in many schools, reinforced by traditional approaches to assessment and achievement and the dominance of testing, particularly high-stakes testing (Carini, Kuh, and Klein 2006; Dutro, Selland, and Bien 2013; Frey and Detterman 2004). This can potentially lead to dissonance between the teachers' own personal and professional beliefs and values around intelligence/ability and the assumptions generated through the system, the school and the classroom. As such, understanding how student teachers build their professional

judgements about young people is essential, if we wish to develop interventions within ITE to encourage critical reflection on, and engagement with, the possible tensions and contradictions in personal and professional beliefs about ability and classroom practices.

In an aspiring inclusive society such as Scotland, where inclusion plays a prominent role in the policy and political speech of parliament as well as the dialogues of Local Authorities and schools (Allan 1999; Florian and Rouse 2009; Pantić and Florian 2015; Pantić, Taiwo, and Martindale 2019; Riddell 2009), an understanding of and engagement with teacher constructs becomes even more imperative (Garmon 2004). The thirst for a model of teaching that engages critically with social justice issues has been proposed for many years, but it is in the last 15 years that we have seen a more explicit embracing of social justice and inclusion principles in Scotland and internationally (Dyches and Boyd 2017; Goodwin and Darity 2019; He, Levin, and Li 2011; Levin 2015; Levin and He 2008; Riddell 2009; Mills and Ballantyne 2016; Shields and Mohan 2008). In terms of Scotland, social justice is embedded in the Professional Standards for Teaching, heralding its importance as one of the core professional values and responsibilities for all teachers, from pre-service through to senior managers (GTCs 2021). However, it is perhaps important to note that what social justice means and how it can be constructed and engaged with during pre-service teacher education is subject to considerable debate (Dyches and Boyd 2017; Goodwin and Darity 2019; Pantić and Florian 2015). Dyches and Boyd (2017), in their discussion of equity in teacher education and a possible social justice model for teacher education, highlight the importance of engaging with teacher belief systems since these directly impact their approach to teaching and learning. The authors call for a combined Social Justice and Pedagogical Content knowledge (SJPACK) model which encourages awareness of the nature of social justice and sensitivity to the ways in which schools and teachers may 'perpetuate and reproduce social inequities' (Dyches and Boyd 2017, 478) by, for example, grouping students by ability (Mazzoli-Smith and Campbell 2016). However, they advocate going beyond awareness towards action and suggest that teachers themselves can challenge inequities within their own classrooms at the very least. The SJPACK model, it is argued, 'holds that educational processes are never apolitical and teachers make instructional decisions that either work to promote a more equitable society or, under the guise of neutrality, they perpetuate hegemony' (Dyches and Boyd 2017, 479). In order to combat the inequities inherent in schooling, then, they suggest the need for a form of critical reflection on social injustices, in order to begin to consider ways of 'disrupting' or challenging the status quo. This approach relies on a critical consideration of teacher positionality and an active engagement with inequities taken for granted within education systems. One of the most pernicious of these is the narrative of ability, its definition and application within every day of schooling and the potential long-term impact upon children's educational journeys (Hamilton 2011a; Hart et al. 2004; Pantić, Taiwo, and Martindale 2019). It is the conceptualisations of intelligence/ability that lead to disadvantaged groups often being treated less favourably and with a more restricted curriculum (Dyches and Boyd 2017).

This article, then, explores and questions the ways in which teachers at a crucial transition point (during pre-service education) attempt to make sense of ability. This transition is particularly significant given that it is at this juncture that teacher tacit or implicit theories (Hamilton 2002, 2006; Sternberg 1985, 2000) can be juxtaposed against contrasting and sometimes challenging narratives around

inclusion. The persistence of teacher tacit knowledge in the face of such challenges (Sternberg 2000) perhaps raises questions about the nature of such constructs and the extent to which they persist in the face of ITE ideas and challenges. Interestingly, there is relatively little research which focuses on student teachers and conceptions of intelligence in terms of their positionality and little which considers ability as multifaceted in the way that this research does (Bråten and Strømsø 2005).

2.2. Pre-service teachers and a crucial transition – beliefs about ability

Previous research has consistently highlighted the importance of teacher beliefs and values more generally over the years (Buehl and Beck 2014; Bullough and Baughman 1997; Deemer 2004; Korthagen 2004; Lavigne 2014; Nias 1989), particularly in student teacher narratives, during a critical transition from learner-teacher to teacher-learner (Bullough and Baughman 1997). Such beliefs are often deeply entrenched within the individual as a result of their own lived experiences and are likely to persist even in the face of conflict with ITE programme input (Hamilton 2015; Mergler et al. 2016; Swann et al. 2012).

If we accept that early identity formation and early professional learning are crucial in shaping the professional identity of new teachers (Day, Elliot, and Kington 2005; Lavigne 2014), then investigating and conceptualising student teacher engagement with a key concept such as ability within ITE is necessary in order to inform future practice and support and to help find a way forward in engaging cognitive dimensions of learning.

The position taken in this study is that identity is comprised of myriad narratives, engendering a dynamic and fluid sense of self in which diverse narratives may influence each other (Tsakalou, Hamilton, and Brown 2018). A web of interlocution, drawing on the social, cultural and historical narratives of self, is constantly in flux as narratives are told and retold shaping the now and future self.

Ability is not an uncontested concept but within policy documents, school systems, structures and teacher judgements, it has often become a taken-for-granted assumption (Boaler, Wiliam, and Brown 2000; Hart et al. 2004; Hamilton and O'Hara 2011a; Oakes 2005; Rattan, Good, and Dweck 2012; Swann et al. 2012). Our own educational experiences have helped to influence us with notions of ability as an entity that not only exists objectively but can also be measured. These informal theories about ability then provide powerful frames for teachers as they apply such concepts to young people within classrooms. Work by Hamilton and others (Francis et al. 2017b; Hamilton and O'Hara 2011; Oakes 2005) highlights the influential nature of ability concepts on teacher expectations, classroom judgements and children's access to and engagement with high-stakes testing (Hamilton and Brown 2005). Yet, to what extent does ITE engage with or challenge ability orthodoxies that see ability as fixed, innate and unlikely to change? Assumptions are frequently implicit in policy and perhaps too in ITE that we all know what ability is and therefore debate is unnecessary. While there is some research focused on intelligence beliefs and qualified teachers in classrooms, very little focuses on student teachers during the pivotal transitional period of ITE. However, the former does provide us with confirmation of the importance of

teacher beliefs for classroom practice and the potential long-term impact on children's progression (Cutler et al. 2019; Haimovitz and Dweck 2017; Rissanen et al. 2018). Additionally, there is no research which looks at both primary and high school student teachers with regard to such beliefs, and it is here that this exploratory research raises concerns.

Research by Dweck in the USA into ability (2006) suggests that what she calls a fixed mindset (focused on an entity view of ability) can have negative consequences for young people. Her alternative approach is to encourage a growth mindset (malleable–incremental conception of ability) that focuses on praise and effort rather than ability levels. The latter approach implies a view of a child's capabilities as something that may be subject to change and improvement. Additional research has been done focusing on a fixed or incremental view of intelligence, building on Dweck's work in this area focusing on either children or teachers, or considering whether ability beliefs might impact on teaching (Aragón et al. 2018; Chin Hai et al. 2018; Cutler et al. 2019). Common to these is the general conception of intelligence being used, i.e. a unidimensional approach. However, there has been a recognition that beliefs about ability are likely to impact on teaching and learning experiences (Fives and Buehl 2016; Haimovitz and Dweck 2017), although this might not manifest in the way one thinks – one teacher had self-identified as having an incremental belief but then applied a fixed mindset belief within the classroom (Cutler et al. 2019). Research into the enactment of teacher beliefs suggests it is likely to be influenced by wider factors such as school ethos or cultural factors (Rissanen et al. 2018); within our framing we would see these as narratives and metanarratives which mediate the process in different ways and at different times.

Work by Blackwell, Trzesniewski, and Dweck (2007) looked closely at the ways that views of ability impacted upon young people during transition into adolescence and noted that those with incremental views won higher grades in standardised assessments than others, including a control group. Likewise, if student teachers engage in an intervention, encouraging an incremental view of intelligence on the part of some students, research suggests there are improvements in children's performances (Ball 2003). Blackwell, Trzesniewski, and Dweck (2007, 248) explored the relationship between children holding incremental views of intelligence (growth mindset) and those holding entity theories (fixed mindset) during a key transition point for young people (junior high school). They established a strong relationship between the theory of intelligence held and achievement, with those holding an incremental theory achieving a more positive achievement trajectory, but they went beyond this relationship to consider the impact of incremental and entity beliefs on motivation/effort. The incremental view of ability, perhaps not surprisingly, had a positive impact upon motivation. In looking at student teachers during an initial transition from learner-teacher to teacher-learner during ITE, we can begin to understand more fully the complexity of student teacher thinking around this topic and raise questions about the implications for practice. This project then set out to create an exploratory study concerned with individual stories of ability found in student teachers (high school and primary) as they approached the final quarter of their one-year Postgraduate Diploma in Teacher Education at a Scottish university.

3. Method

3.1. Framing the study

This work emerges from previous work by Hamilton (2011a) surrounding a socially constructed world of multiple personal and societal narratives and metanarratives. Teacher identity then emerges from and develops in relation to such narratives. Somers (1994) captures this as a narrative identity which ‘embeds the actor within relationships and stories that shift over time and space’ (621).

The complexity inherent in this view means that intelligence or ability is not unidimensional but instead must be comprised of multiple layers or constructs. The question then emerges as to how sense can be made of such a multiplicity of narratives. In an earlier paper the nature of teacher narrative identity was more fully explored and discussed (Hamilton 2011a), but while we still acknowledge multiple layers of influence and meaning, this study locates these narratives within a tripartite frame of personhood in order to obtain a window into the pre-service teachers’ beliefs and experiences of ability.

We believe that there is frequently an assumption that ability/intelligence is universally understood and experienced, but we suggest that there may be differences, not only across individuals but within the person, dependent on the positioning of the individual in relation to lived experiences and roles. Here we explain our own approach while drawing on authors such as Harre (1998) and Somers (1994), key figures in relation to self and narrative respectively.

As educationalists, we are happy to draw on other disciplines, to amend, adapt or build on ideas from elsewhere and in doing so, enrich and enhance our own field of study. In this article, we have located the broad concept of identity in relation to narrative identity theory grounded in sociology, as it helps us to characterise identity as a messy web of narratives, telling the stories of individuals in relation to multiple narratives and meta narratives, influenced by some more than others at different times. This ‘web of interlocation’ (Somers 1994) captures, for us, the potential complexity of participant stories and their influences. However, while agreeing that this captures our thoughts about identity, when wanting to look closely at particular aspects of professional and learner experiences, beliefs and actions, this busy web can make it difficult to focus on the key narratives that will allow us, in this instance, to capture the fullness of student teacher engagement with intelligence. Harre’s (1998) work provides us with the opportunity to look more closely at the embodied individual in respect of various differences or similarities of lived stories with regard to intelligence/ability. Our selves, shaped by our personalities, attributes and memories, are unique to us and create narrative clusters distinct from those of others. Harre’s (1998) original model of personhood uses the concept of a standard model of self, made up of three selves. Self 1 the embodied self – from here the self perceives and acts upon the environment. Self 2 – a person’s beliefs about his or her self. Self 3 – how I present myself to others and how I believe others see me. Note that these may at times overlap or combine. The qualities of personhood in this model are that there are distinct components recognising a state of being and perceiving, acting and experiencing. Embracing the spirit of Harre’s work, we adapted his ideas to build a model which helped to shape our approach to understanding intelligence as

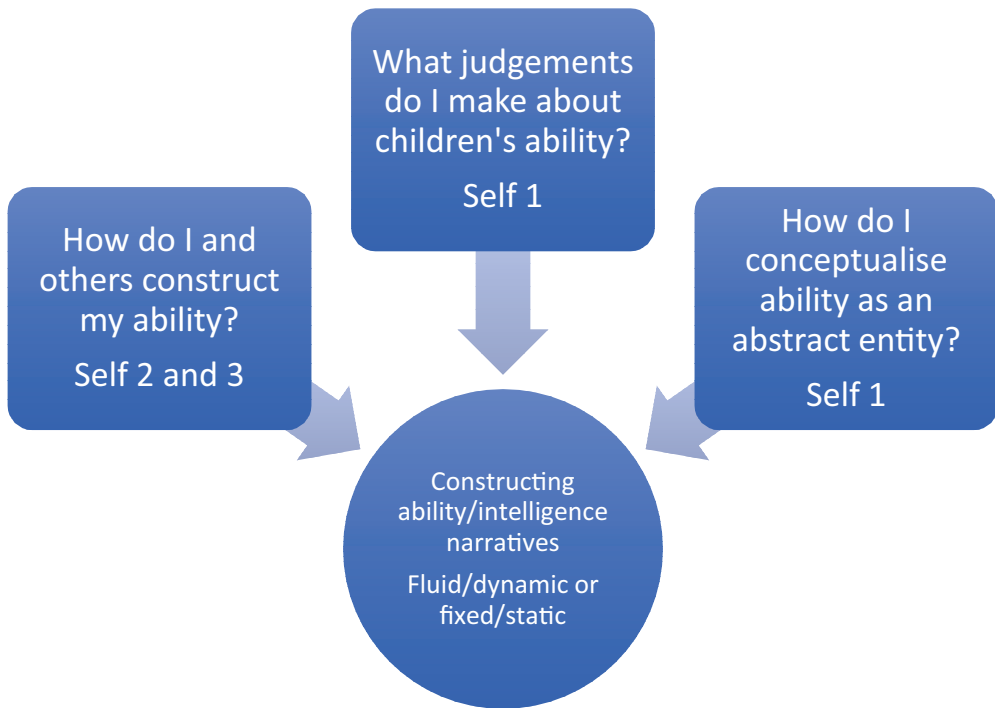


Figure 1. Tripartite frame – understanding and engaging with intelligence.

something perceived and experienced in potentially diverse ways with implications for subsequent actions. In the diagram in [Figure 1](#), How do I conceptualise ability as an abstract entity?, we draw on the importance of the point of view of the embodied individual thinking about the concept of intelligence (Self 1). What judgement do I make about children's ability? This question in the research involves both judgements and consequent actions with regard to ability as teachers in a classroom (Self 1). Finally, how do I perceive my own intelligence and how do I perceive others' constructs of my intelligence? (my perceptions as a student teacher of my own ability and my perception of my tutors' views of my ability) (Self 2 and 3). If all three of these elements reflected similar conceptions of ability, we might conclude that intelligence beliefs tend to harmonise and are closer to a unidimensional model. However, diverse and even contradictory beliefs are likely to reinforce the idea of a multi-dimensional construct with the potential for dissonance.

This tripartite frame for considering intelligence is represented above, but it must be acknowledged that the different components of this conceptual frame may mutually influence each other and may in turn be influenced by the many strands within the web of narratives. Using this tridimensional mode for capturing significant components of ability construction, it was hoped that new insights would be gained which would allow a fuller study to be generated built around the deliberate targeting of ability within sequenced events across a one-year postgraduate teacher training programme as a means of creating stronger dissonance within individuals and so a fuller engagement with and awareness of ability issues.

3.1.1. Context

As mentioned earlier, Scotland has its own distinctive education system, and a population of around five million. A central tenet of the education system is the belief in the enriching, empowering qualities of educational opportunities for both self and society (Humes and Bryce 2018). There has been a strong commitment in wider society for the dominant comprehensive all-comer high school model, with around 95% of high school-age children attending such schools in the Scottish context. There has also been a strong commitment to an inclusive approach and egalitarian principles in policy for many years (Pantić and Florian 2015; Pantić, Taiwo, and Martindale 2019; Riddell 2016; Scottish Government 2011). Social justice values are important underpinnings of the system; Riddell (2016) considers this is best illustrated in recent years through the publication of the Scottish Government (2013) in advance of the Scottish Independence Referendum in 2014, as providing clear illustration and a 'prime example' (Riddell 2016, 551) of a commitment to education as a means to promote social justice.

Teaching is an all-graduate profession here, and most new teachers for primary and high school levels undertake a postgraduate one-year Initial Teacher Education (ITE) programme, which is accredited by the General Teaching Council for Scotland (GTCS). In order to teach in state schools, new teachers must have achieved a standard sufficient for initial or Provisional Registration with the Council. At the end of a probationary year teaching in schools, they are expected to have reached the level for Full Registration (GTCS 2021).

3.2. Aims and research questions

The aims of the study were:

Aim: To establish student teacher constructions of ability/intelligence within a tridimensional frame and to explore potential conflicts and challenges in relation to teaching and learning.

Research questions were then generated:

- (a) How do student teachers conceptualise intelligence (ability) generally?
- (b) How do student teachers understand their own and others' conceptions of their ability?
- (c) How do student teachers conceptualise young people's abilities?

3.3. The study

As an exploratory project, this work set out to establish an overview of student teacher views during teacher education to inform future detailed mixed-methods work. Consequently, a questionnaire was generated, informed by Hamilton's previous work (2002) and in conjunction with colleagues at the University of Glasgow. Informed by Dweck's work on Fixed versus Growth Mindsets (2006), the questionnaire was then further enhanced to help us understand the multifaceted nature of ability more fully. This was to provide a broader understanding that would allow potential patterns and themes to emerge. The next stage of this research in the future will build on this to establish a more

substantial overview across the national context using the questionnaire and qualitative data collection that will concentrate upon individual interviews and focus groups.

For this preliminary project, volunteers were sought from two initial teacher education programmes (PGDE – Post Graduate Diploma in Education) at a city university in Scotland: one-year intensive courses for those who had already completed an undergraduate degree. One cohort was preparing to teach in high schools (young people 12 to 18 years), while the other cohort was preparing to work in primary or nursery schools (children 3 to 12 years). Forty-one took part from the primary contingent, and 46 from the secondary group. The total number of participants achieved across both groups was $n = 87$ – this provided a response rate of 39% and 42% respectively. It was anticipated that, given the potentially limited numbers within one institution, simple descriptive statistics would provide preliminary insights into the usefulness of the tripartite frame and possible similarities and differences between primary and secondary student teachers.

3.3.1. Piloting

A questionnaire which drew on mainly quantitative elements was generated and piloted with focus groups and individuals, allowing for rich feedback and provisional responses which could provide an insight into methodological problems as well as into potential emerging themes. Having edited the questionnaire in light of participant feedback, a refined version was finalised and a copy is available through this link: <https://edinburgh.onlinesurveys.ac.uk/conceptualising-intelligence>. There were 20 questions, including four open-ended ones. Each section in the findings provides information about the questions and choice of answers.

3.3.2. Analysis

Having tested and improved the questionnaire, we focused on quantitative responses. However, our key variable was primary or secondary student teacher. There were insufficient numbers of males on both programmes to allow us to draw helpful conclusions about gender and any role it might play in engagement with ability. The descriptive statistics achieved through the questionnaire were used to consider whether our suggested approach to ability construction could help us to understand whether ability was unidimensional or multifaceted in student teachers' beliefs and practices and possibly contradictory in nature according to the positionality of the student teacher.

3.3.3. Ethical issues

As one of the research team was a tutor on both courses, it was important that great care was taken to ensure that clear parameters were established separating the remit of the research from any tutor judgements. Guidelines provided by the Scottish Educational Research Association (sera.ac.uk) informed this approach to ethical considerations. In addition, the research was submitted to the ethics committee of the university concerned for approval. Questionnaires were completed anonymously and on a voluntary basis.

Both the timing and the nature of the administration of the questionnaire were problematic. Student teachers had to be able to comment on their perceptions of university staff and school staff and consequently needed to have had experience of both which would allow them to make informed judgements. Questionnaires were administered after students had experienced two thirds of their university course and

after they had been on placement in schools for 10 to 12 weeks. Volunteers were sought from both primary and high school programmes, and the researcher gave advice and information on the purpose of the research prior to seeking volunteers from each programme group.

3.3.3.1. Validity and reliability. The support for a rigorous research process and the creation of a robust data collection instrument (through piloting) by researchers allowed for reflection on and critical engagement with decision-making. This helped to make the research instrument robust and processes explicit and also enhanced researcher reflexivity. Response rates were comparatively good given that with questionnaires, researchers frequently find it very difficult to attain reasonable participation (Hamilton and Corbett-Whittier 2013).

However, there are obvious limitations in such an exploratory project since only two ITE programmes in one institution were used for data collection. These could provide insights into the beliefs of these particular student teachers and the potentially complex positionality of these teachers in relation to different conceptualisations of intelligence. Nonetheless, the limited scope of the project meant that we were unable to generalise our findings, but we were able to confirm the legitimacy of our conceptualisations of intelligence and the importance of looking into these on a broader scale within national and/or international contexts in the future. A better understanding of pre-service teachers' engagement with intelligence may help us to identify new ways of challenging ability orthodoxies within ITE and ability grouping as a key strategy within schools and classrooms.

4. Results

4.1. Nature of ability

Postgraduate Diploma in Education Primary student teachers (PGDE PTs) ($n = 41$) and PGDE Secondary (High School) student teachers (PGDE STs) ($n = 46$)

The questionnaire initially established student teacher views on the nature of intelligence whether general or specific, fluid or fixed, genetic versus environment, the relationship between grades and intelligence and the significance of IQ if any. Primary student teachers focused primarily on intelligence as a combination of both general and specific intelligences (78%) while 60% of secondary student teachers opted for this combination (Table 1), with an additional 34% of the latter group focusing on intelligence as a general quality.

Table 1. Nature of ability – how do I conceptualise ability/intelligence as an abstract concept?

Nature of ability/intelligence	PGDE PT	PGDE ST
General	14%	34%
General + specific	78%	60%
Only separate specific intelligences	8%	6%

Given the increased prominence of theorists such as Gardner (1985, 2011) and his multiple intelligence theory in the latter 20 years of the twentieth century and increasingly in the twenty-first century, this result is perhaps unexpected, but it does underline

the importance of societal narratives surrounding intelligence that tend to reflect a persistent general concept. The notion of general intelligence or *g* dominated much of the twentieth century when IQ testing gained prominence as a means of capturing how intelligent a child was, and such assessments still form an important position within educational measurement communities, as can be seen in the 34% of pre-service high school teachers who identified *g* as reflecting their view of ability. Yet the possible prominence of Gardner's work in ITE programmes is not reflected in the percentage of student teachers that supported separate intelligences (8% and 6% respectively).

4.2. Fixed or fluid

The next element considered was whether intelligence was fixed or fluid. Here (Table 2), a high proportion of PGDE PTs and PGDE STs considered that intelligence could not be increased although skills and knowledge could be acquired (75% and 69%). The latter stance is likely to contribute to teachers' approaches to teaching and learning and to curricular emphases and limitations. If these new teachers believe that ability cannot be improved, then there are fundamental questions to be asked about how they perceive their role as a teacher if they cannot affect or improve children's abilities.

Table 2. Ability/Intelligence – fixed or fluid.

Ability/intelligence – fixed or fluid	PGDE PT	PGDE ST
Fixed	6%	3%
Hard work = increase intelligence	19%	28%
New skills/knowledge but no increase in intelligence	75%	69%

4.3. Innate or environmental

The extent to which intelligence is innate or shaped by the environment (Table 3) led to PGDE PTs emphasising a more genetic influence on intelligence, while those on the PGDE ST opted more strongly for an environmental influence playing a part in intelligence. This further suggests a belief in the limited influence that school and teachers might have on pupils.

Table 3. Ability/Intelligence – innate or shaped by environment.

Ability/intelligence – innate or shaped by environment	PGDE PT	PGDE ST
Wholly shaped by genetics		6%
Mainly genetic and to lesser extent environment	53%	30%
Mainly environment and to limited extent genetics	31%	47%
Wholly shaped by environment		2%
Invalid responses	16%	5%

4.4. Do grades reflect intelligence?

Next, the questionnaire explored whether student teachers believed there was any link between grades and intelligence. As can be seen in Table 4, there was a strong belief in grades attained in school as indicators of intelligence and other factors (78% and 65% respectively), although there were still 14% of PTs and 26% of STs who viewed grades only

as a good indicator of intelligence. This latter view raises concerns about the ways in which these teachers might be more likely to accept performance as indicative of all a child can achieve. Limited expectations can lead to stifled learning (Hart et al. 2004).

Table 4. Any link between grades and ability.

Any link between grades and ability	PGDE PT	PGDE ST
Grades do not reflect intelligence	8%	9%
Grades = intelligence + other factors	78%	65%
Grades good indicator of intelligence	14%	26%

4.5. IQ testing and intelligence

Student teachers were also asked about IQ tests and whether these were seen as capturing levels of intelligence. PGDE STs came down strongly against IQ tests reflecting intelligence (84%), while PGDE PTs provided a mixed response – 56% felt such tests did not measure intelligence while 41% did. This does seem to suggest that intelligence is seen by a limited number of primary teachers as a reified entity that can be measured, while others are suspicious of the notion of this kind of testing. It would be hoped, given the debate around testing and intelligence, that most teachers would be sceptical about what IQ tests might indicate and these results reflect that scepticism. Yet, while not accepting IQ testing, a good proportion of student teachers did accept grades (performance in school) as reflecting intelligence while also acknowledging that other factors might come into play.

4.6. Student teacher self-perception and intelligence PT $n = 41$ and ST $n = 46$

Most student teachers used a strong degree of norm referencing to establish their own intelligence, highlighting their improvement over time in comparison with others (PT – 60%: ST – 62%). Effort or persistence was seen as important for student teachers, but achievement was still seen as limited or constrained by their intelligence. Indeed, 35% and 27% respectively of respondents felt that they would give up on tasks that they considered to be beyond their intelligence level, while 50% and 56% believed that intelligence would limit the extent to which any progression in achievement could be made. This contrasts with 39% and 42% who believed that they would persist in the face of challenges, as success was considered a possibility in the face of their persistence.

Student teachers drew on a variety of elements when explaining what they valued as an indicator of their own intelligence, but the main components were creativity and problem solving followed by understanding and communication of ideas and finally grades, whether in tests or degree exam results. This reflects a much broader notion of intelligence with the emphasis on creativity and problem solving and grading as a confirmatory factor.

4.7. What do I value as indicators of my intelligence, generally, and on my university programme? What do I believe schools and tutors value as indicators of my intelligence?

Here student teachers were asked open-ended questions about what they valued about their intelligence and what tutors and schools looked for in relation to their intelligence.

Answers were individual words or short phrases. Students focused on problem-solving skills and communicative skills as general indicators of their intelligence and echoed this in relation to valued indicators on their programme, with the addition of constructive reflection as an important element.

In contrast, student teachers believed that tutors judged their intelligence based predominantly on grades and assessments on courses, while also judging the extent to which they were capable of understanding and applying knowledge in the classroom.

On the course – Mainly from essay marks/course work is the way they really decide on how smart you are/essays definitely/look at grades on your course

Schools on the other hand were naturally thought to be more interested in subject knowledge, good reflective practice and communication.

In school - Primary teachers: ability to be self-critical/reflective/good communicating with children.

For high school teachers – subject specific knowledge/quality of subject specialisms/self-reflections

Evaluations of intelligence based on university work were focused strongly on grades, reinforcing their own school experiences where grades would have been a major factor in which ability group they would have been placed in, the curriculum they experienced and the opportunities for external awards. This contrasted with the more subtle indicators that student teachers themselves valued such as problem-solving.

4.8. How do I see others? Children's intelligence and teacher influence

In Table 5, primary school and secondary school student teachers suggested that in looking at children's intelligence, they would mostly make decisions focused on either individual progress and norm referencing (52% and 62% respectively) or to a lesser extent comparison with others with some consideration of progress over time (24% and 18%).

Table 5. How do student teachers gauge children's intelligence and what influence can teachers have on children's intelligence?

Children's intelligence	Primary teachers n = 46	High School teachers n = 41	Teacher influence on pupil intelligence	Primary teachers n = 46	High School teachers n = 41
Comparison with others	7%	-	I can increase children's intelligence but always a limit	30%	22%
Mostly comparison with others but also individual progress	24%	18%	I can help children learn new things but can't change intelligence	45%	56%
Progress over time	17%	20%	I can help children become more intelligent – there is no limit	23%	22%
Mostly progress over time but also comparison with others	52%	62%	No response	2%	

Both PT student teachers and ST student teachers were asked about their possible influence on children's intelligence. Here there appeared to be a mixed view, but there is the suggestion that most believed that teachers could help children to learn but could not change their intelligence (45% and 56%), followed by 30% and 22% who thought that there could be some change in intelligence but that there was a predetermined limit. A smaller proportion thought that children could become more intelligent with teacher input and this change had no limit (23% and 22%).

The significance for young people could be quite considerable, depending on the student teacher views on their possible impact on young people. It is clear that most student teachers believed that their possible influence on children's intelligence was very limited (75% and 78% overall), leaving only 23% and 22% who took a more fluid view of children's potential for improvement in intelligence.

4.9. Evaluating pupil intelligence

In Tables 6 and 7, it can be seen that student teachers suggested a variety of ways in which they might make judgements about children's level of intelligence, but the dominant tool used and relied upon was teacher judgement via teacher classroom tests, children's participation in class and teacher observations. However, there were some differences between primary and high school student teachers. For primary student teachers, participation in class (93%), class tests (95%) and teacher observation (85%) dominated and were given highest priority. In comparison, student secondary teachers focused highly on pupil participation (91%) and class tests (96%) but in conjunction with exam results at 96% and with high priority.

As might be expected in this context, IQ tests were not used much to help gauge children, but national tests and external exams were suggested as important markers.

Table 6. Primary student teachers evaluating pupil intelligence.

Primary student teachers N = 41	Would use this to form a view of intelligence (please tick all that apply)	Priority 1 = high priority; 7 = low Most frequent priority given
Standardised tests such as Edinburgh Reading Test	36%	4
Exam results/national tests	29%	2
IQ tests	5%	6
Participation in class	93%	1
Class tests/other class work	95%	1
Other (please specify) Teacher observation	85%	2

Table 7. High school teachers evaluating pupil intelligence.

Secondary student teachers N = 46	Would use this to form a view of intelligence (please tick all that apply)	Priority 1 = high priority; 7 = low Most frequent priority given
Standardised tests such as Edinburgh Reading Test	22%	6
Exam results/national tests	96%	2
IQ tests	11%	7
Participation in class	91%	1
Class tests/other class work	96%	1
Other (please specify) Teacher observation	43%	2

Although there was evidence of varied sources being considered, student teachers were most confident of their own views. Given the views expressed earlier, on the nature of intelligence and whether it was fixed or limited, and the possible influence teachers might have on children's intelligence, it is worrying that teachers in this project were so focused on their own judgement. It is important to consider, too, the possible impact on young people of a possible entity conception of ability (Blackwell, Trzesniewski, and Dweck 2007). We know from previous research (Blackwell, Trzesniewski, and Dweck 2007) that when young people hold incremental views of ability, this tends to have a positive impact upon attainment over an extended period of time. It was noted that this was particularly important during adolescence when young people attend high school. Yet for any such incremental views to be effective in enhancing student motivation, teachers themselves need to have incremental views. In this research, it is clear that these student teachers may hold to different ability constructs depending on their positionality in relation to the concept and to the context.

Student teachers suggested a variety of ways in which they might make judgements about children's level of intelligence, but the dominant tool used and relied upon was teacher judgement. Bearing in mind the views expressed earlier on the nature of intelligence and whether it was fixed or limited, and the possible influence teachers might have on children's intelligence, it is worrying that teachers in this project were so focused on their own judgement.

Additionally, it is essential that we recognise the possible impact on young people of a possible entity conception of ability (Blackwell, Trzesniewski, and Dweck 2007). Since we know from previous research (Blackwell, Trzesniewski, and Dweck 2007) that when young people hold incremental views of ability, this tends to have a positive impact upon attainment over an extended period of time. It was noted that this was particularly important during adolescence when young people attend high school. Yet for any such incremental views to be effective in enhancing student motivation, teachers themselves need to have incremental views. In this research, it is clear that these student teachers may hold to different ability constructs depending on their positionality in relation to the concept and to the context.

5. Discussion

5.1. *Incremental versus fixed?*

Work by Blackwell et al. (2007) highlighted the difference that particular theories of intelligence can have on junior high school students, and they noted that those holding incremental views of intelligence saw increasing motivation and achievement and a greater sense of self-efficacy. They also highlighted the benefit of teaching young people about an incremental theory of intelligence and how this can bring about changes in students' beliefs and motivations. In turn, teachers' own approaches to young people can be changed and enhanced through teacher-oriented incremental theories of intelligence (Blackwell, Trzesniewski, and Dweck 2007). From this starting point, we set out to understand how existing groups of student teachers for primary (elementary) and high school in Scotland engaged with incremental or entity conceptualisations without formal input in this area. We found that, rather than being a case of holding one or the other,

these student teachers held multifaceted views on intelligence dependent on the personhood perspective or positionality taken, and that they did not seem to realise the potential for dissonance across these outlooks. There was evidence that these student teachers were aware of a need to consider intelligence as having malleable qualities when they spoke of an abstract idea of intelligence. However, when looking for any distinctions between primary school student teachers and high school student teachers as individuals, there appeared to be a slightly more prevalent view of intelligence as measurable within high school student teachers. This was perhaps influenced by the dominance of testing, particularly high-stakes testing in school during this period.

There was then a contrast for many student teachers in how they perceived their own ability and how they believed university tutors gauged their intelligence. Their own perceptions of self pointed to a more nebulous quality exhibiting creativity and problem-solving skills as indicative of ability. Yet this seemed to be at odds with how they believed tutors evaluated their work. In the latter, tutors were thought to use more measurement of summative work rather than an evaluation of intelligence qualities. The teacher education programmes themselves were being seen as more entity focused. Yet according to Blackwell et al. (2007), encouraging teachers to hold an incremental view of intelligence can have the potential to affect student beliefs and motivation, leading to higher student performance although the caveat is that a teacher stating self-belief in an incremental stance may not necessarily mean they employ an incremental approach in the classroom (Cutler et al. 2019). The latter research highlights one instance of this happening and reinforces the importance of considering teacher engagement with intelligence beyond the general abstract concept. Perhaps it was most concerning, then, to find that student teachers in this study focused on an entity view of intelligence when evaluating a child's intelligence or ability. These different views point to a need for an active deconstruction of intelligence concepts for student teachers and tutors in order to explicitly challenge the latent dissonance and to engage critically with entity and incremental views of intelligence. Additionally, there is a need for discussion of the possible spaces where teachers can engage productively through an incremental lens during practice and within the building of professional learning communities. Individual agency within the classroom may bring about localised change in regard to ability, but they may seldom engage explicitly with power imbalances and imposed power structures (Dyches and Boyd 2017).

Working within policy contexts that are focused on performativity and deterministic views of ability can bring pressure to bear on teachers to conform to particular ways of working, organising and teaching young people. This can lead to the use of setting (tracking) children by previous attainment that often leads to inequity and further disadvantages the disadvantaged (Francis et al. 2017a, 2017b; Gillborn and Youdell 2001; Hargreaves 2019; Taylor et al. 2017). To try to work with an incremental view of intelligence within such powerful structures and imperatives is particularly challenging, and yet it is feasible to find ways forward which meet or surpass the currency of attainment while also engaging in an approach to the education of young people that moves away from deterministic notions of ability. An account of such work is found in an article by Jackson and Povey (2019) which highlights the use of all-attainment class (mixed-ability) teaching, where a powerful belief in the transformative potential of education as an instrument for social justice led to the development of collaborative

and creative approaches to pedagogy and learning. It was highlighted that there was a need for teachers to find spaces for negotiation and the building of professional learning communities in order to gain impetus for such challenges to the tyranny of ability thinking.

As a result of our study, we feel we can confirm that the conflicting notions of intelligence seen across these three positions confirm that intelligence can be seen, experienced and applied in diverse ways within each individual – reinforcing that ability is not unidimensional in these student teacher experiences and decision-making, and that in order to engage with the complexity of intelligence thinking, we need to look beyond simple conceptions of the construct. The student teachers in this current study reflected the dissonance inherent in trying to bring about reconciliation of certain beliefs, especially if implicit theories of ability are not made explicit during Initial Teacher Education. Currently, there are very few ITE programmes in Scotland that explicitly engage with assumptions about intelligence. We would advocate activities and interactions that take concepts of intelligence and encourage student teachers to make their beliefs explicit and, in so doing, to challenge them. The greatest weakness currently, we would suggest, is that intelligence is such a taken-for-granted concept that it is not problematised. In order to encourage a more critical view of their assumptions, we would suggest using learner-centred problem solving where student teachers are supported in working collaboratively on projects, for example, small teacher inquiry or active debates around the topic of intelligence in the classroom where student teachers are encouraged to take the position which seems to be in opposition to their own beliefs. In these forms of active learning, teacher educators or other students can take on the role of provocateur as a way to make dissonant beliefs explicit and so encouraging critical reflexivity. Alternatively, the student teacher him/herself may investigate the arguments for alternative views and the implications for practice.

Through engagement with intelligence theories at this significant transition point and their own implicit beliefs, it may be possible to create teachers truly able to bring about transformative practice and learning. To do so, however, requires time, support and the space to draw on experiences from a variety of contexts. The approach illustrated through the Tripartite Frame in [Figure 1](#) points to one means to support teachers at all stages to articulate their personal and professional beliefs and values across the three sources. In order to encourage the first tentative steps into meaningful engagement with a malleable intelligence, student teachers may need to be supported to challenge these beliefs and assumptions within their ITE programme, but also must find significant spaces in their own classrooms for such work to occur while also playing the game of entity thinking demanded by the system (Braun and Maguire 2018; Pantić, Taiwo, and Martindale 2019; Swann et al. 2012). Yet new teacher willingness to do so may rely on a critical engagement with intelligence or ability thinking as part of a social justice approach during pre-service education and the willingness of teacher educators to deliberately challenge taken-for-granted assumptions around such a fundamental aspect of classroom life.

We would like to build on this research in the future through an extension of this research into a wider range of ITE programmes in Scotland and also in a cross-case comparison of each jurisdiction of the UK, building on questionnaire use as before but

also collecting interview and observational data to deepen our understanding of student teacher journeys across ITE experiences. By using a mixed-methods approach and widening the scope of our work, we believe that we can engage more profoundly with such a quietly dominant and subversive subject and how it may impact teacher decision-making and children's classroom experiences

6. Conclusion

It should concern us that, in the twenty-first century, a penchant for testing and provision based on a reified notion of intelligence can be seen to continue flourishing despite the frequent claim in many societies to strive for some kind of equity within education systems (Hollier 2018; Shields and Mohan 2008). Investigating the ways in which pre-service and new teachers approach and understand intelligence would seem crucial if we are to encourage a critical and informed debate as well as potentially transformative teaching and learning in our classrooms. Within a period of extensive and ongoing teacher education reform across the world (Ball 2003; Braun and Maguire 2018; Cochran-Smith et al. 2016; Zeichner, Payne, and Brayko 2015), the burgeoning marketisation of education and an emphasis on performativity and accountability (Bartell et al. 2019; Braun and Maguire 2018; Zeichner, Payne, and Brayko 2015), we might argue that competing discourses are fighting for the soul of teacher preparation (Ball 2003). The increasing marketisation of teacher education (Beauchamp et al. 2016; Braun and Maguire 2018; Cochran-Smith 2001; Zeichner, Payne, and Brayko 2015) and the consequent diverse routes into teaching can lead to a reduced, atheoretical and conformist teacher profession succumbing to external control and accepting the values of the market. Policy discourses that emphasise practicality and relevance (Beauchamp et al. 2016) rather than critical reflection and inquiry can obscure possible spaces for dissent and debate and narrow conceptualisations of intelligence, restricting student experiences and potential achievements (Hart et al. 2004; Hart, Swann, and Yarker 2019; Swann et al. 2012). In order to encourage pre-service teachers to build on a critical awareness of issues of equity and diversity in regard to the key concept of intelligence as they move into the profession, there is a need to find ways to encourage new teachers to see themselves as agents of change (Cochran-Smith, Gleeson, and Mitchell 2010; Dyches and Boyd 2017) within a broader social justice model in order to combat and potentially transform children's learning experiences.

Note

1. Intelligence and ability are used interchangeably reflecting the currency of both terms in teacher thinking.

Disclosure statement

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