

AN EXPLORATION OF THE EPISTEMIC DIMENSION OF PRESERVICE TEACHERS' IDENTITY

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Abstract: This paper identifies and illustrates binary epistemic dynamics influencing the construction of preservice teachers' pedagogical identity. An exploratory pilot study was used to explore epistemic change and constancy in preservice teachers' (n = 19) identity across five binary constructs (e.g., nature/nurture) used to structure an introductory subject in a Graduate Diploma of Education. The study revealed instances of dynamic interactivity between structure and content influencing participants' tendency to polarise, depolarise, neutralise, relativise, and correlate binary constructs. Some of these dynamics problematise epistemological theories which propose linear development between absolutist, multiplist, and evaluativist ways of knowing (Tabak & Weinstock, 2008). The study offers tentative support for incorporating epistemic pedagogies in preservice teacher education courses and expanding the dialogue over the direction and metaphor of development used to construct teachers' epistemic identity.

Keywords: epistemics, epistemological development, teacher identity

Introduction

Epistemology is concerned with ways of knowing. Epistemics reflects a concern with the cognitive, social and affective dynamics of real-world contexts that produce and transform ways of knowing. A teacher's personal epistemology (i.e., their way of knowing and beliefs about knowledge) exerts a powerful influence on their ability to perceive and engage the diversity and complexity of educational environments (Bendixen & Feucht, 2010; Khine, 2008). The link between epistemology and education is receiving increasing attention from researchers who appreciate the reciprocal relationship between a teacher's personal epistemology and their pedagogical identity (e.g., Bendixen & Feucht, 2010; Khine, 2008; Schraw & Olafson, 2008). For example, Schraw and Olafson (2008) call for future research to explore 'the extent to which the type and amount of preservice teacher education training affects epistemological and ontological worldviews' (p. 39). Such research would add to existing claims that there is an important epistemic dimension to a teachers' pedagogical identity as manifested in everyday ways of valuing, nurturing, motivating, guiding, and

relating to students (Borko & Putnam, 1996). Accordingly, this paper explores the relationship between epistemic and pedagogical identity.

Epistemic identity refers to characteristic ways of knowing that construct, and are constructed by, the life-world of an individual or group. These ways of knowing represent implicit or explicit ideas and beliefs about knowledge, or attitudes to knowledge, that (in the context of education) may be expressed in anything from behaviour management styles to motivational techniques. For the purposes of this paper, epistemic identity is theorised using a general consensus of developmental theories described in Hofer and Pintrich (1997). These developmental theories propose a natural progression through qualitatively different and increasingly complex epistemologies. The general consensus of these developmental theories is that:

Development proceeds from (1) “absolutist” – the conception of knowledge and knowing as objective and absolute; to (2) “multiplist” regarding all knowledge as subjective and relative and, therefore, indeterminate because of multiple points of view; to (3) “evaluativist” – the acceptance and integration of subjective and objective aspects of knowledge that would permit a degree of evaluation and judgement of knowledge claims. (Tabak & Weinstock, 2008, p. 178)

A premise of this study is that different epistemological developments and trajectories can influence teacher identity and praxis.

Teacher identity relates to the fluid constellation of knowledge and ways of knowing, and being and ways of being that an individual teacher represents within a particular school context. Understandably, teacher identity is a central construct in preservice teacher education courses. For example, the introductory chapter of the prescribed text for the preservice teachers in this study notes:

The shape of identity and belief formation, professional thinking and decision making (i.e., deciding what actions to take) will be unique for each of us. Further, our identity will change over time in response to reflecting upon our professional knowledge and practice, the learning outcomes our students achieve, and the ideas we are exposed to from colleagues, researchers and other stakeholders in education. (Churchill, et al, 2011, p. 16)

Some researchers have proposed that this 'change over time' in teacher identity reflects a sequence of epistemological development. For example, Van Rossum and Hamer (2010, p. 15) suggest that conceptions of a good teacher develop in the following sequence: A good teacher (1) imparts structured knowledge, (2) transmits structured knowledge, (3) interacts and shapes knowledge, (4) challenges and develops thinking, (5) teaches through dialogue, and (6) teaches through mutual trust, authentic relationships and care. They propose that this sequence reflects a progressive development on a continuum from teacher-directed to student-directed practice. Teacher-directed and student-directed practice represents one binary construct relevant to the exploration of a relationship between pedagogical and epistemic identity.

There are many binary constructs that are of similar importance in the recognition of a teacher's identity. The structuring of binary relationships in sociocultural contexts can powerfully reveal epistemic identity (e.g., Reich, 2002; Perry, 1970). Binary relationships refer to the types of relationship (e.g., conflict, complement, negation) between the parts of a pair. A binary is a pair of concepts usually related as opposites or alternatives (e.g., Liberal/ Conservative, Traditional/Progressive, and Subjective/Objective). Binaries are simple but powerful categories of knowledge that enable discrimination and selection between concepts and entities, and relative descriptions of concepts and entities. They allow the learner to choose one and/or the other and to locate their knowledge in relation to the knowledge of others. Binaries are the enablers of choice and decision that make knowledge powerful and meaningful. However, binaries can be de-contextualised (or pre-contextualised) which can lead to dualistic and dichotomising tendencies. Here, the structure of knowledge (the way of knowing or epistemology) dominates the accumulation and transformative possibilities of human experience. For example, teacher-centred or student-centred approaches may be viewed and valued, a priori, as 'good' or 'bad'. The broader purpose of this pilot study is to map and re-contextualise participants' epistemologies in order to facilitate more conscious and evaluative ways of knowing. This specific purpose of this paper is to identify and illustrate some binary epistemic dynamics that interact with preservice teacher identity.

Specifically, this study utilises five binary constructs (Appendix A) on the basis of their presence in teacher education literature and school discourse. These five binary constructs include (1) teacher-centred and student-centred approaches to learning, (2) natural and nurtured approaches to ability, (3) inclusive and exclusive approaches to diversity, (4) intrinsic and extrinsic approaches to motivation, and (5) permissive and authoritarian approaches to management. Binary constructs are used for their relevance in educational discourse and for their ability to reveal epistemic sophistication through the diverse ways in which the parts of a binary pair can be related. Collectively, the constructs are used to represent significant considerations in teachers' everyday practice and the formation of teacher identity.

Method

Context and participants The exploratory pilot study was conducted with preservice teachers (n = 19) in the introductory subject of a Graduate Diploma of Education at a regional Australian university. The participants include 10 females and 9 males aged between 20 and 50 from a variety of tertiary backgrounds in science, arts, and technology. The subject - *Foundations of Education* - introduces a range of theoretical approaches to the study of the histories, philosophies and practices of education.

Data collection and analysis The study piloted a data collection scale – The Binary Differential Scale (Appendix B) and a pedagogical tool - The Binary Differential Grid (Appendix C). The Binary Differential Scale (BDS) provides a mixed-methods way to collect and analyse data relevant to epistemic positions and change. The Binary Differential Grid (BDG) is pedagogical tool for implicitly developing increasingly complex and evaluative epistemologies (Adam, 2011).

The Binary Differential Scale (BDS) is designed to (1) quantitatively identify structural changes and dynamics related to binary epistemic beliefs and/or (2) qualitatively identify content and contexts influencing binary epistemic change. In its basic form, the BDS is a seven-point interval scale (3, 2, 1, 0, 1, 2, 3)¹ with intervals evenly distributed between two poles (the *left binary* and *right binary*) of a binary construct (e.g.

¹ The left binary intervals are coded -3, -2, -1 for quantitative analysis.

natural/synthetic). The centre-point interval is subdivided into a 'neutral' and 'no identification' zone. The neutral position is scored as a zero (0). The no-identification position is factored in overall case frequency analyses to show the percentage of cases who did not identify with the binary construct at all. The BDS is slightly different to a Likert Scale because it allows for the identification of multiple positions and is reliant on interdependent binary constructs (e.g., intrinsic motivation and extrinsic motivation), rather than topical statements. It is more similar to a Semantic Differential Scale in its use of binary constructs but seeks to examine epistemic dimensions of binary evaluations rather than attitudes². As noted, a participant can identify one or more positions during each period. For example, in light of the 'nature/nurture' binary, a participant indicating Position 3 on the Left Binary during Period 1 would likely have a strong identification with a natural perspective in a specific domain (e.g. intelligence). A participant indicating Position 3 on the left binary and the right binary would likely have a strong identification with natural and nurtured approaches³. Cumulatively, the collection of related quantitative scales enables quantitative representation of binary relationships and dynamics in and through time.

While part of the scale enables a quantitative representation of binary relationships and dynamics, these relationships and dynamics can be effectively explored with the complementary qualitative data. For example, how does a participant rationalise or explain a 'strong identification with the left binary during period 1' or 'no identification during period 2'? The open-ended data box (Appendix B) is used to gather complementary information to rationalise and contextualise the quantitative identification. The interval scale was directly linked to the open-ended qualitative identification so that the technique provided complementary numerical and narrative data. The narrative data from the BDS was analysed using qualitative thematic

² Though, no doubt, *epistemology* and *attitude* are linked constructs.

³ Participants who indicate multiple positions during the same period often have a more contextual approach than participants who identify strongly with only the left or right binary.

coding (theory-led and inductive) to cross-reference numerical data and to explore specific formative influences on participant positions in and through time.

The BDS was used to collect qualitative and quantitative data on epistemic change influenced by focus groups, which were structured using the BDG. Ethical approval for the study was granted by the institution's ethics body and all participants signed informed consent forms for the use of data. Collectively, data were gathered from each participant during a two-week period using (1) four⁴ different Binary Differential Scales with accompanying qualitative rationales, each administered at three different intervals throughout the subject, and (2) four different Binary Differential Grids completed collaboratively during four focus group sessions, each of 1.5 hours duration. These data collection techniques were described in the Subject Outline and embedded into the subject structure using a Preparation Booklet. Participants submitted their completed Preparation Booklet (containing the completed binary scales, qualitative rationales, and binary grids) with their final assessment – a series of short reflective essays outlining their current identification with each binary construct. These data were then subjected to quantitative analyses for central tendency (mean and median) and individual variation, and theory-led and inductive qualitative analyses.

Results and Analysis

Given the small sample and exploratory nature of the study, the purpose of the quantitative analyses was to identify individual variations to direct qualitative analyses, rather than support statistical generalisations about cohort identity. The intention of this paper is to identify general epistemic dynamics and illustrate them with individual participant responses from the data. Archetypal qualitative examples of individual positions, change, and variance were identified from a quantitative analysis of the BDS. These dynamics serve to highlight some of the interactions between preservice teachers' epistemic and pedagogical identities.

⁴ Preservice teachers engaged with four out of five binary constructs depending on their focus group rotation.

Quantitative Data. Quantitative data generated from the binary differential scales were analysed for individual and group central tendency and variation in time (i.e., at a particular interval) and over time (i.e., across the three intervals) in relation to each of the five binary constructs. More specifically, cohort central tendency and variations were used to examine:

1. binary identification (e.g., 32% of participants indicated an initial identification with a teacher-centred approach),
2. binary identification over time (e.g., 32% of participants indicated an initial identification with a teacher-centred approach compared to 23% of participants at the third identification),
3. overall correlation of binaries (e.g., cohort initially identified with student-centred, nurture-based, inclusive, and extrinsic motivations),
4. overall correlation of binaries over time (e.g., cohort finally identified with student-centred, nurture-based, inclusive, and intrinsic motivations),
5. gender differentiation⁵ for binary identification (e.g., 40% of female participants initially identified with teacher-centred approaches, whereas 22% of male participants initially identified with teacher-centred approaches), and
6. gender differentiation for binary identification over time (e.g., 40% of female participants initially identified with teacher-centred approaches, whereas 17% of female participants finally identified with teacher-centred approaches).

Individual variations and central tendency were examined to identify preservice teachers who demonstrated:

1. the most dichotomising identifications (e.g., strong identification with authoritarian approaches),
2. the most dichotomising identifications over time (e.g., movement from a weak identification with nature-based influence to a strong identification with nature-based influence),
3. the most complementary identifications (e.g., strong identification with inclusive and exclusive approaches),
4. the most complementary identifications over time (e.g., strong identification with inclusive and exclusive approaches at all three intervals),

⁵ Larger cohort sizes could be used to identify generational effects as well as gender effects.

5. the most significant switch between binary identifications over time (e.g., movement from a strong identification with a teacher-centred approach to a strong identification with a student-centred approach),
6. the most de-dichotomising identifications over time (e.g., movement from a strong identification with an authoritarian approach to a complementary strong identification with a permissive approach), and
7. the most stable identifications over time (e.g., a moderate identification with a student-centred approach at all three time intervals).

Table 1 reveals that the cohort identity was initially characterised by a preference for student-centred, nurture-based, inclusive, extrinsic, and authoritarian pedagogical approaches. The cohort identity was characterised in the final period by a preference for student-centred, nurture-based, inclusive, intrinsic, and an equal mix of permissive and authoritarian pedagogical approaches. The greatest range of positions during the initial period was associated with the teacher-centred and student-centred binary (3, 2) and the intrinsic and extrinsic binary (2, 3). The biggest range of positions during the final period were associated with the teacher-centred and student-centred binary (3, 2.5) and the inclusive and exclusive binary (3, 1). The least range of positions during the initial period was associated with the inclusive and exclusive binary (2.5, 1). The least range of positions during the final period was associated with the intrinsic and extrinsic binary (2, 0).

The greatest cohort change between the first and final period was the change from a preference for extrinsic to intrinsic approaches to motivation. The least cohort change between the first and final period was in the slight strengthening of identification with student-centred approaches. Other changes included (1) an overall weakening of identification with nurture-based approaches, (2) an overall strengthening of identification with inclusive approaches, and (3) an overall weakening of identification with authoritarian approaches.

Table 1. Cohort Central Tendencies for Binaries in First and Final Period

Binary Construct (Left and Right)	Period 1			Period 3		
	<i>n</i>	<i>M</i> <i>M*</i>	<i>Mdn</i> <i>Range (L, R)</i>	<i>n</i>	<i>M</i>	<i>Mdn</i> <i>Range (L-R)</i>
(L) Student-Centred	19	0.07 (L)	0.00	13	0.23 (L)	0.00
(R) Teacher-Centred	13	0.06 (L)	(3, 2)			(3, 2.5)
(L) Nurture	18	1.33 (L)	1.50 (L)	15	0.73 (L)	0.50 (L)
(R) Nature	15	1.17 (L)	(3, 0)			(3, 0)
(L) Inclusive	12	0.92 (L)	0.75 (L)	7	1.30 (L)	2.00 (L)
(R) Exclusive	7	0.71 (L)	(2.5, 1)			(3, 1)
(L) Intrinsic Motivation	15	0.05 (R)	0.00	10	0.75 (L)	1.00 (L)
(R) Extrinsic Motivation	10	0.38 (R)	(2, 3)			(2, 0)
(L) Permissive	10	0.00	0.75 (R)	9	0.00	0.00
(R) Authoritarian	9	0.28 (R)	(2.5, 2)			(.5, .5)

Note. (L) = Left Binary, (R) = Right Binary, (*M*) = Mean, (*Mdn*) = Median. Figures represent averages on the 7-point (3, 2, 1, 0, 1, 2, 3) Binary Differential Scale (BDS). 3(L) or 3(R) are the maximum possible values. A zero (0) value would indicate an average cohort neutrality for a particular binary.

* The second mean is based only on participants who completed both periods.

Table 2. Epistemic Trajectories in Binary Constructs Over Time

Binary	Epistemic Trajectory				
	<i>n</i>	Increased Polarisation	Decreased Polarisation	Switched Polarity	Maintained Position
1	13	23%	38%	8%	31%
2	15	27%	40%	0%	33%
3	7	29%	14%	14%	43%
4	10	30%	20%	30%	20%

5	10	10%	90%	0%	0%
Average		22%	40%	10%	25%

Table 3. Participant Correlation Between Binaries in First and Final Period

Binary	Period	Participant and Gender																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		F	M	M	F	F	M	F	M	M	F	M	M	F	F	F	F	M	M	F
(L) Student-Centred	1	L	N	R	N	N	L	R	R	L	L	L	L	R	R	R	N	L	L	N
(R) Teacher-Centred	3	L	N	R	N	-	-	-	R	L	-	-	L	N	N	L	R	N	L	-
(L) Nurture	1	L	L	L	N	N	-	L	N	L	L	L	L	L	L	N	N	L	L	
(R) Nature	3	L	L	L	N	L	-	-	N	L	-	N	L	N	N	N	L	N	L	-
(L) Inclusive	1	L	L	-	-	L	-	N	-	L	-	L	L	R	-	R	-	L	L	L
(R) Exclusive	3	N	L	-	-	-	-	-	-	-	-	-	L	R	-	L	-	L	L	-
(L) Intrinsic	1	R	-	R	N	N	-	L	N	-	N	L	N	L	R	R	N	L	L	R
(R) Extrinsic	3	L	-	L	L	-	-	-	L	-	L	-	-	-	L	N	N	N	L	-
(L) Permissive	1	-	L	R	R	-	-	-	R	L	L	-	R	R	N	-	R	-	-	-
(R) Authoritarian	3	-	N	N	N	-	-	-	N	-	L	-	N	N	R	-	N	-	-	-

Note. (L) = Left Binary, (R) = Right Binary, (N) = Neutral, (-) Incomplete, (F) Female, (M) Male.

Further analysis was used to explore individual variance from central tendency. Table 2 reveals general cohort trends through time, while Table 3 reveals individual participant trajectories across the five binary constructs over time. Quantitatively identified examples of individual variance were identified for qualitative analyses (theory-led and inductive) of complementary open-ended data. The following qualitative analysis helps to illustrate some of the structural and content dynamics affecting preservice teachers’ epistemic and pedagogical identity in light of individuals’ qualifications to their quantitative identifications.

Qualitative Data. This section identifies and illustrates binary epistemic dynamics interacting with pre-service teachers’ pedagogical identities. These dynamics include (1) polarisation, (2) depolarisation, (3) neutralisation, (4) relativisation, and (5) construct correlation. Collectively, these dynamics provide a preliminary insight into the interdependence of teachers’ epistemic and pedagogical identity.

Polarisation. Polarisation indicates a strong tendency to identify more with one binary pole (e.g. nature) than another (e.g. nurture). Polarisation reflects an epistemic tendency when the participant displays

a predisposition to attack or neglect the opposing binary independent of contextual, semantic, or situational factors. For relational and interdependent binaries, this sort of tendency could be considered characteristic of dichotomising, dualising, and absolutising epistemologies (i.e., black and white, either/or thinking). One participant indicated consistently strong identifications with left binaries across a range of constructs:

It is my opinion that learning is at the core of human experience and therefore the motivation to learn naturally comes from within the individual. The quest for knowledge comes from natural motivation. To serve education from outside someone's natural curiosity is to dull the experience. (Participant 6; Binary 1: 1)

Society is capitalist so that it values logico-mathematical intelligence and empowers the practical. (Participant 6; Binary 3: 1)

Authoritarian styles create hegemonically masculine heroes. (Participant 6; Binary 5 Grid)

This participant had strong negative school-life experiences representing the right binary. For him, the 'right' binaries represented a homogenised set of pedagogies characterised by patriarchal, masculine competitiveness and conformity. Understandably, the participant's pedagogical identity was powerfully defined in relation to these constructions. Another participant who had strong identifications with the left binary offered a similar rationalisation:

Coming from an authoritarian educator's background, I now lean towards a more permissive management style. Students need an opportunity to participate in the relevant regulations which will govern their learning environment so they can own it more. (Participant 9; Binary 5:1)

This participant had strong recollections of indiscriminately administered corporal punishments.

Conversely, a participant with different life experiences tended to identify strongly with the opposite binary:

Teachers have a responsibility to take some control of the classroom situation. This would be dependent on the class, age, year level etc. I think it could come down to a 'give them an inch, they take a mile' attitude. (Participant 14; Binary 1:1)

This participant recalled negative school-life experiences with the left binary. Polarisation does not necessarily equate with epistemic simplicity in that it often reflects the strength of an individual's subjective experience. However, the ability to reconcile one's own subjective experience with others' conflicting subjective experiences is an indicator of epistemic complexity.

No participant became significantly more committed to their initial binary, or significantly more committed to a particular binary from a neutral position. However, the participant who did show most movement offers an interesting explanation:

I moved a bit further along. I like the thought of the exception becoming the norm and that inclusivity in the classroom can have a positive change on society in general. (Participant 12; Binary 3:3)

This participant seems to acknowledge the relativity of the binary scale in relation to an underlying reality. Here, today's extreme inclusivity is tomorrow's normal pedagogical practice. For this participant, there is no 'neutral' position, for all positions are relative to changing and emerging possible 'realities'. Inclusivity is a possibility to be further realised by turning the exception into the norm. Neutrality, Left, and Right are abstract concepts that break down between reality and possibility. However, the epistemic neutralisation of the proposition is that it could be equally used by a participant advocating for change in a different direction. Though, perhaps equally absurd is the possibility of remaining epistemically neutral in all things. Arguably, epistemically sophisticated individuals can hold subjectively polarised positions, while acknowledging the possibility and place for opposing subjectivities. However, epistemically simplistic polarisations reflect an assimilative way of knowing with little allowance for transformative dialectic with new knowledge and experience.

Participants with the most polarised epistemic tendencies have often had the most polarising life-experiences. Participant responses reveal the strong relationship between life experience, teacher identity, and epistemic identity. Formative life experiences powerfully influence participants' identification with either the left or right binary. For example, one participant reflected on the inclusive-exclusive binary in

light of their rural upbringing: ‘Coming from a small country town where I completed primary and secondary education, the focus on learning the dominant culture was strong. Moving to the city for university I was faced with culture shock’ (Participant 19; Binary 3:2). Another participant reflected on the same binary in light of its application to special needs education:

I feel strongly that some children are benefited more by individualised attention and attending separate special schools where they feel included rather than excluded or different. I probably hold this view after experiences and talking with my own mother who taught special education for a long time. (Participant 13; Binary 3:1)

One participant reflected on the nature-nurture binary in light of family member’s experience: ‘A family member was diagnosed with dyslexia at a young age, however, after rigorous practice of reading and writing encouraged by their mother he was able to overcome his genetic disability and become a poet’ (Participant 10; Binary 2:1). Yet another participant reflected on the authoritarian-permissive binary in light of her previous experience:

I do not value the authoritarian style of teaching where students must follow strict rules. I had a friend in primary school who was very timid and found it difficult to approach our Year Two teacher who was strict and used to scream at us. (Participant 10; Binary 5:1)

The strength of these identifications can influence the development of contextual and evaluative reasoning which requires the ability to hold individual subjectivities and abstracted objectivities (or inter-subjectivities) in tension.

A switch between binary polarisations over time (i.e., from left to right binary, or vice-versa) seems to represent a horizontal rather than a developmental epistemic movement. This was a rare occurrence in the study, with only five instances from four participants recorded across all binaries. Three of these switches occurred in the intrinsic-extrinsic binary construct. One participant who switched from exclusive to inclusive constructs wrote the following rationalisations during periods one and three, respectively:

I believe that we should see each other as humans living in one world. We should celebrate differences but not to the point that we are separating people. Everyone has a background that should be valued, but too much focus on that can cause us to lose the ‘big picture’ view of the world. (Participant 15; Binary 3:1)

I’ve chosen to switch to the inclusive binary now that I understand more about the topic. I want [sic] include many cultural experiences into the classroom, but in a way that brings everyone together. I understand that it may be harder to do in practice than in theory. (Participant 15; Binary 3:2)

The participant initially focussed more on the negative potential of the left binary – that inclusion through multiculturalism could inadvertently increase separation through over-emphasis on difference. The switch reflected a new emphasis on the positive potential of inclusion as a way of ‘bringing people together’. This participant’s movement reflects identity transitions between the binaries. Identity can be epistemically bound to one perspective until it is challenged to see and understand a different perspective. Arguably, an increasingly inter-subjective representation of different perspectives on the same binary construct prompts a movement towards contextual and evaluative epistemologies (or possibly more conflict).

An important lesson for teacher educators is not to assume a direct correlation between an individual’s absolutism or polarisation and their capacity for epistemological sophistication. Rather, the strength of epistemological polarisation is closely related to the particular life-world of an individual. The journey towards relational and contextual reasoning is much longer for some than others, due more to the distance they have to travel than to the pace at which they progress. It may also be that the degree of past polarisation is related to the potential depth of future contextualisation. Teachers with epistemic depth may be those who have had to work hardest to see their own subjectivities in context in order to better understand and accommodate the opposing subjectivities of others. Arguably, the most epistemically sophisticated teachers are those who can most fluidly contextualise, decontextualise, and recontextualise their subjectivities.

Depolarisation. The central assumption of linear theories of epistemological development is that movement proceeds from dualistic to multiplistic to evaluativistic ways of knowing. Evaluativistic ways of

knowing are characterised by an awareness of context. This developmental dynamic was evident in participant reflections. For example, one participant reflected:

Context is a big issue to change some of my thinking . . . now theorising that it all depends on other factors (subject, pupils, group dynamics) . . . both approaches are need to fit with certain situations, environments. (Participant 2: Binary 5:2-3).

A different participant also explicitly refers to an increasing appreciation of contextuality after the use of the BDG: ‘My position moved towards the centre more as the old context chestnut came back into the issue . . . Depends on the context!’ (Participant 12; Binary 5:2). Participants who explicitly recognised contextuality over time tended to de-polarise their positions. Participants with the least movement over time tended to have well developed understandings of contextuality in the initial period. For example, one participant told the researcher that she had spent much time reflecting on the nature-nurture binary during her previous science degree. In the initial period she reflected, ‘These two “sides” [Nature and Nurture] appear to actually be cyclically related, making it impossible to say one is a greater influence than the other’ (Participant 13; Binary 2:1). Predictably, she maintained her position over the duration of the study. Other participants reflected on the formative role of their research in the week following the focus groups: ‘After research and further reflection, I believe it is possible to incorporate the two approaches in classrooms. However, before choosing the learning approach, the subject/context needs to be considered’ (Participant 19; Binary 1:3). Collectively, these responses typify an epistemic effect (i.e., knowledge is increasingly seen as contextual) on the domains of teacher identity examined in this study.

There is evidence from this exploratory study that this epistemic appreciation of contextuality was fostered by the focus groups. The focus groups were structured using the BDG which foregrounds the epistemic issue (to accommodate or assimilate) by creating equal visual spaces for the representation of different values and perspectives. One participant notes, ‘My position came closer to the neutral following the discussion. Mainly because of the discussions around context. The context of a situation will determine whether a child-centred or teacher-centred approach is employed’ (Participant 12; Binary 1:2). Another

participant also noted the effect of the focus group in relation to the nature-nurture binary construct: ‘Post-group session I became convinced that nature does have a role to play in hereditary intellectual capacity’ (Participant 2; Binary 2:2). The focus groups work to expand participants’ access to contents, experiences, and values associated with each binary construct. However, as participants encounter more contents, experiences, values and perspectives, they are faced with a cognitive choice between assimilation and accommodation. For example, one participant in the group who tended to emphasise the potentially negative effects of the right binary and the potentially positive effects of the left binary, indicated a student-centred preference overall during the initial period: ‘An authoritarian approach can lead to non-interaction – rebellion, whereas a permissive approach can lead to greater interaction’ (Participant 2; Binary 5:1). However, the participant then engaged with the life experiences of fellow focus-group members. Some of these members spoke of different experiences related to same binary. These participants shared formative life experiences that revealed some of the potential negatives that they associated with permissive approaches and the potential positives of authoritarian approaches. For example, one student expressed their frustration at being unable to learn in a class that took advantage of the teacher’s permissiveness. Another student expressed their cultural discomfort at the relative permissiveness of some Australian classrooms. Over time and through inter-subjective sharing, the different dimensions of the binary are brought into focus. Participants must either reject or ignore the integrity of their fellow participants’ experiences to maintain their own polarisations, or re-contextualise their own subjectivities to better account for the multiple subjectivities of their group. The latter scenario seems to account for Participant Two’s response *after* the focus group.

Context is a big issue to change some of my thinking . . . now theorizing that it all depends on other factors (subject, pupils, group dynamics) . . . both approaches are need to fit with certain situations, environments. (Participant 2: Binary 5:2-3)

Arguably, this is illustrative evidence of the development of more sophisticated epistemic structures to better account for multiple life-experiences and related perspectives. Participants with more relativistic epistemologies to begin with, tend to find it easier to accommodate diverse perspectives by contextualising

them. However, participants with initially oppositional or polarising epistemologies often find it difficult to maintain the integrity of perspectives that differ subjectively from their own. Similarly, those with multiplistic epistemologies may find it difficult to accommodate dichotomising epistemologies.

Neutralisation or Non-Polarisation. Participant responses revealed a range of relationships between left and right binaries. Arguably, some relationships (e.g., non-polarisation) reveal more sophisticated epistemologies than others (e.g., naïve polarisation). Non-polarising developmental relationships express the need for a chronological emphasis on one binary (i.e., nature or nurture) before the other. For example, one participant argued that extrinsic and intrinsic approaches to motivation are both valuable in-context, but that age-dependent contexts mean that extrinsic approaches are more appropriate at younger ages than intrinsic approaches:

External motivations can often manifest into internal motivations . . . Extrinsic motivation is really important with younger children and intrinsic motivation is more important the older you get. Extrinsic at a young age helps to develop a sense of self worth and self-respect which are key to making the shift to intrinsic motivation and internalization which comes with more developed cognitive frameworks. (Participant 1; Binary 4:1-2)

Perhaps revealing a structuring principle, the same participant also adopted a developmental approach to the binary between authoritarian and permissive approaches: ‘I believe that younger children (1 – 7 yrs) need boundaries defining. As they get older and understand the boundaries a ‘permissive’ approach becomes more feasible as the boundaries that are pushed are less risky’ (Participant 1: Binary 5:1). A different participant took a developmental approach to teacher-centred and student-centred binary construct: ‘I have never had to fully enforce a TCE style before. After hearing different sides of the spectrum I am now leaning more towards a neutral position with a directional focus leaning more towards a CCE outcome (Participant 17;

Binary 1:3). Developmental relationships reveal an awareness of context (i.e., age) that moves beyond simplistic oppositional relationships between left and right binaries⁶.

Similarly, non-polarising complementary relationships tend to emphasise the need for both approaches (i.e., the left and right binary) to be valued in different contexts or for the development of different skills. For example, one participant noted that, ‘Teacher-centred education is very important in order to teach content. Child-centred education is equally important to develop critical thinking and essential skills like interpersonal communication’ (Participant 4; Binary 1:3). Another participant expressed a similar perspective for the same binary construct:

Both orientations have their places in education and instead of being viewed as binary opposites it may be useful to think of how one can build on the other, e.g., TCE providing the basic foundations leading to CCE where students can explore and work with new understandings. (Participant 13; Binary 1:3)

Some participants demonstrated complementarity through a rejection of both binary extremes. For example, one participant argued, ‘Both authoritarian and permissive methods of behaviour management are poor methods. One promotes control and oppression, whilst the other promotes anarchy’ (Participant 4; Binary 5:3). This participant notes the negative complementarity of binary extremes. The tendency to reason about binary relationships using complementarity seems indicative of sophisticated epistemologies, where knowledge is seen as relational and contextual.

Some participants seemed to demonstrate an extra level of epistemic complexity in their reasoning about binary relationships. These participants used complementary epistemologies but also noted the relative interdependence of the left and right binary. For example, one participant reflected on the inclusive-exclusive binary construct: ‘Inclusive: Exclusive. Can you have one without the other? You can be inclusively

⁶ This is not to say that there cannot be sophisticated oppositional relationships between left and right binaries.

excluded or exclusively included' (Participant 1; Binary 3). Another participant reflected on the extrinsic-intrinsic binary construct, 'Some times it's hard to see if it's an internal or external reward . . . such a grey area, to one person it may be intrinsic whereas to the other it may be extrinsic' (Participant 3; Binary 4:2). For most participants, this realisation of relativity developed only in the final period after reflection, research and engagement with the BDG during focus groups:

After reflection and some further reading I concluded that there is some irony to earlier debates of nature VERSUS nurture as the consensus now seems to be that both factors are highly relevant and interconnected to an extent that both may exert an influence on the other. (Participant 8; Binary 2:3)

Some participants noted an underlying relativism between 'realism and idealism' underlying all binary constructs. One participant reflected on the inclusion-exclusion binary as follows, 'Inclusion may be utopia but exclusion is reality' (Participant 11; Binary 3). This participant later indicated a dialectical rather than oppositional relationship between 'the real' and 'the ideal'. Other participants tended to privilege 'realism' over 'idealism' or vice-versa. Arguably, across contexts this position is less epistemically sophisticated than the first position.

Relative identification effect. Comparative analysis of participants' quantitative identifications and qualitative rationales revealed a relative identification effect in rare but significant cases. Relative identification effect relates to a demonstrable mismatch between an individual's self-identification relative to others, and their actual identification relative to others. The effect can be seen in qualitative responses and reveals some of the complexities of measuring and differentiating between simplistic and sophisticated epistemologies. For example, the following participant quantitatively identified with the strongest possible 'nurture' position in the 'nature-nurture' binary. However their qualitative reasoning was less polarised than some other participants who had identified with a more moderate or balanced position:

Genetic and biological factors may impact upon a student's ability to learn in particular ways (for example, special needs scenarios), but generally cultural and environmental influences form / affect learning and behaviour. (Participant 9; Binary 2:2)

Possibly, this response reveals a relative identification effect such that the participant believes themselves to be ‘relatively’ left or right of the group consensus, while expressing a relatively balanced explanation when the cohort is examined as a whole. The effect may see some teachers self-identify differently with binaries depending on the measure used and/or their parameters of comparison.

Construct correlation. Finally, some participants explicitly noted the relationships between different binary constructs. The following student demonstrated the strongest correlation between ‘left’ binaries in the cohort. His responses demonstrate awareness of the structural similarity between different binaries. ‘I now see ties between educational instruction TC [teacher-centred] or SC [student-centred] and motivation which I couldn’t see before. I see self-motivation and autonomy as vitally important to students and thus put greater value in SC education’ (Participant 18; Binary 1:3). Another participant also explicitly noted structural similarities between binary relationships in different constructs: ‘Our discussion was very similar to our CCE / TCE talk we had yesterday. We determined that you have to establish a base you are then able to nurture’ (Participant 17; Binary 2:2). The possible existence of correlations between binary constructs raises broader issues concerning the structural and cultural relationships between binaries. For example, one mature-aged participant reflected on the relative cultural change from exclusive to inclusive, extrinsic to intrinsic, authoritarian to permissive, and teacher-centred to student-centred approaches that he had witnessed during his lifetime. Indicatively, he noted ‘Australia is following other Western nations in adopting an ideology of valuing diversity’ (Participant 9; Binary 3:2). The participant’s personal pedagogical identity reflected the broader transitions in the Australian milieu. As a child, he felt he had experienced the negative side of teacher-centred, authoritarian, exclusive, and extrinsic pedagogies. This participant’s experience highlights the generational and cultural dynamics that interact with the epistemic dimension of teacher identity.

Discussion

This section offers some identification and elaboration of key considerations concerning the relationship between epistemic identity and teacher identity. Specifically, it discusses (1) the importance of epistemological development in the formation of teacher identity, (2) the possibility of facilitating

epistemological development through epistemic pedagogies, and (3) the end and continuity of epistemological development.

The importance of epistemological development. Teachers work in diverse and complex environments characterised by multiple discourses and overlapping contextual boundaries. The epistemic challenge for pre-service teachers preparing to work in such environments is to develop ways of knowing that can assimilate this complexity without unnecessary reduction or oversimplification. Naive epistemological polarisations (one size fits all) can limit teachers' repertoire of pedagogies. Epistemically polarising teachers can be mono-dimensionally authoritarian or permissive, inclusive or exclusive. Conversely, naive multiplicities (every size fits every thing) can immobilise teachers with an indefinite number of pedagogies haphazardly applied to all or any contexts. Such teachers use authoritarian or permissive, extrinsic or intrinsic approaches without regard to context. However, teachers who have evaluative epistemologies make pedagogical choices that are carefully aligned to contexts. They may also recognise their subjectivities and seek contexts that healthily expand or engage with these subjectivities. Is it possible to facilitate the development of such evaluativist and contextualist epistemologies?

Facilitating epistemological development. This pilot study represents a slice of time across a lifetime in the development of preservice teachers' identities. However, if teachers do develop epistemologically, they develop in relation to the accumulation and processing of life experiences. It is impossible to accurately measure the chaotic accumulation and formative value of life-experiences. However, formative teaching moments and experiences can and do occur. These moments probably represent a catalytic point of transition or change built on many other hidden accumulated experiences, but they are significant nonetheless. This study's use of focus groups structured with an implicitly epistemic tool (the BDG) represents *one* such catalyst for the epistemic development of *some* preservice teachers related to *some* domains of teacher identity. The fact that some participants developed, or became more aware of the relational and contextual nature of their pedagogical identities without explicit epistemological instruction, suggests that there is a place for epistemic events to help facilitate authentic epistemological development.

The end and continuity of epistemological development. This study also reveals the diversity of pedagogical identities across the five binary constructs. This diversity raises further questions about epistemological development. Do all teachers with evaluative epistemologies think the same? Are theories of epistemological development merely projects towards conformity and neutralisation? Are complex epistemologies ineffectively neutralising or ineffectively all-embracing of binary spectra? Such questions invoke the debate over the supremacy of relativistic epistemologies. Arguably, relativistic ways of knowing are not the 'absolute' end of an epistemic development, rather, they exist 'in relation' to absolutistic and positivistic epistemologies in a perennial dialectic that it seems humanly impossible to step outside. Complex epistemologies do not merely seek to naively objectify knowledge or extinguish different ways of knowing in the pursuit of a neutral or middle position, for neutral and middle positions only exist in the presence of opposites. Rather, complex epistemologies recognise that the implicit tensions and paradoxes between subjective and objective, real and ideal, a priori and a posteriori cannot be reduced or collapsed without loss of meaning and identity. Similarly, the pedagogical tensions and paradoxical relationships between teacher-centred and student-centred approaches, intrinsic and extrinsic motivations, inclusive and exclusive approaches, permissive and authoritarian approaches, and nature and nurture, can be embraced as navigational orientations in a sea of fluidity, rather than collapsed into a meaningless silence or chosen between once and for all. Epistemic complexity allows teachers to more clearly recognise their subjectivities and better navigate their fluid environments by recognising the subjectivities of others – their colleagues and students. Epistemic sophistication can perhaps reduce but not collapse the conflicts that arise when different contextual boundaries compete for the same space in the school environment.

Conclusion

The study of binary epistemic dynamics offers a rich field for future study. In the context of education, binary epistemics can offer an insight into the construction of teacher identities that are central to school and classroom environments. Binary epistemic pedagogies can offer ways of facilitating the development of more complex evaluative and contextual epistemologies. This exploratory pilot study has identified and

illustrated binary epistemic dynamics from preservice teacher identifications with five binary constructs including, (1) teacher-centred and student-centred approaches, (2) nature-based and nurture-based approaches, (3) inclusive and exclusive approaches, (4) intrinsic and extrinsic approaches, and (5) permissive and authoritarian approaches. The study revealed that the use of binary epistemic tools and pedagogies can catalyse awareness of the contextual and relational dynamics that characterise sophisticated epistemologies. Preservice teachers can change their identifications in short time periods punctuated by formative learning experiences. Furthermore, the study illustrated the range and complexity of binary epistemic dynamics interacting within and between participants' life-worlds. These dynamics invite further exploration with larger cohorts, with different binary constructs, and in different contexts. Finally, 'how' teachers know can never be separated from the study of 'what' and 'where' teachers know in space and time. In a milieu characterised by the paradoxically increasing flux and fixedness of boundaries, there is a place for epistemic studies and methodologies that both respect and cross traditional boundaries between qualitative and quantitative, and subjective and objective approaches to knowledge.

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Appendix A: Binary Constructs for Teacher Identity

Table 1. Binary Constructs for Teacher Identity

Binary Construct	Left Binary	Right Binary
1	Student-Centred: Focuses on the student as the discoverer and creator of knowledge and the teacher as co-learner and facilitator of knowing.	Teacher-Centred: Focuses on the teacher as transmitter of expert knowledge and the child as recipient of knowledge.
2	Nurtured: Focuses on environmental influences on learning and behaviour.	Natural: Focuses on genetic and biological influences on individual learning and behaviour.
3	Inclusive: Focuses on the minority through active inclusion and celebration of difference.	Exclusive: Focuses on the majority through active exclusion and celebration of conformity.
4	Intrinsic: Focuses on internally generated task-satisfaction to motivate behaviour.	Extrinsic: Focuses on externally administered rewards and punishments to motivate behaviour.
5	Permissive: Focuses on freeing students from top-down power, rules, and organisation.	Authoritarian: Focuses on controlling students through top-down power, rules, and organisation.

Note. The left and right binaries were randomised in the study in order to avoid associative bias with ‘left-wing’ or ‘right-wing’ groupings. However, there is reason to believe that preservice teachers’ individual identities and the identity of teaching in particular sociocultural contexts reflects this particular alignment.

Appendix B: Binary Differential Scale (BDS)

<i>Left Binary</i>			BINARY	<i>Right Binary</i>			RELEVANCE
3 Strong Identification	2 Moderate Identification	1 Weak Identification	Neutral Identification	1 Weak Identification	2 Moderate Identification	3 Strong Identification	None
			No Identification				Low
							Moderate
							High

Figure B.1 Binary Differential Scale (BDS): Quantitative Identification. The BDS is an interval scale for the identification of binary relationships and the domain-specific relevance of binary constructs. The BDS allows for multiple identifications and non-identifications.

<i>Left Binary</i>	BINARY	<i>Right Binary</i>	PERIOD
Position Reflection: Why have you identified this position and what formative experiences have influenced your position?			

Figure B.2 Binary Differential Scale (BDS): Qualitative Identification. The BDS can be administered to collect qualitative data offering complementary reflections and reasoning on the quantitative position. This is especially applicable to smaller case studies and longitudinal studies examining epistemic trajectories and dynamics over time.

Appendix C: Binary Differential Grid (BDG)

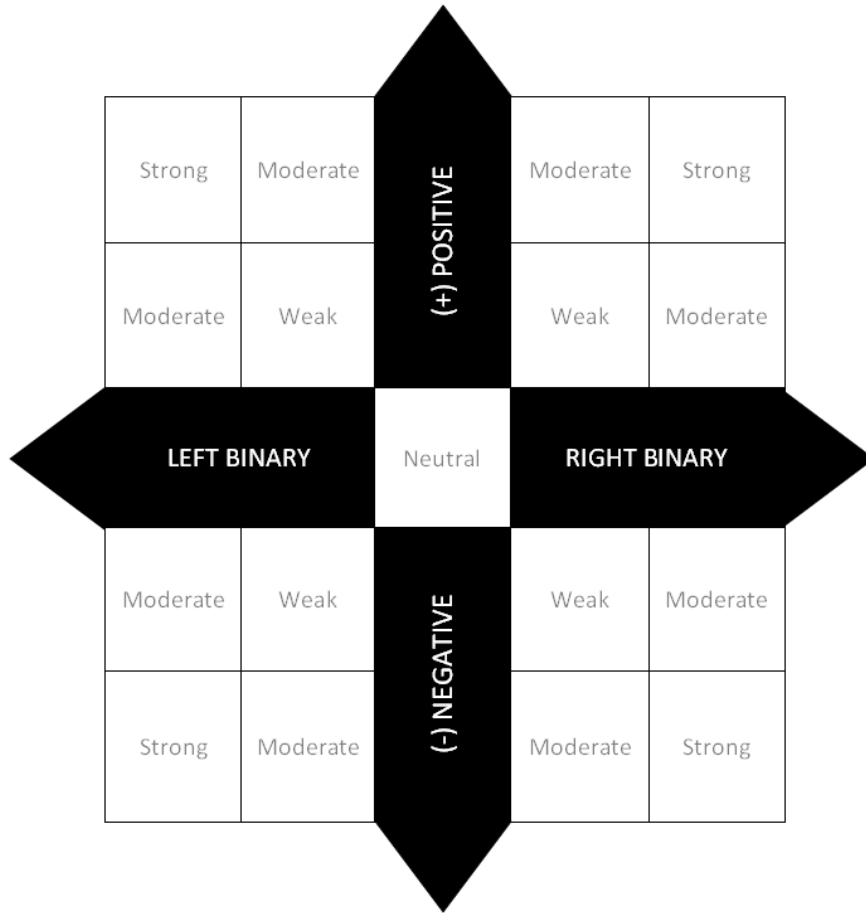


Figure C1. Binary Differential Grid (BDG): Sample Template. The Binary Differential Grid (BDG) is a pedagogical tool to facilitate epistemological development from simplistic dualisms to contextualised understandings. Participants identify and record formative experiences, evidence, and attitudes in relation to a binary pair in order to explore (1) the complexity of relationships between binaries, (2) the relativity and contextuality of binaries, (3) the diverse experiences that produce identity in relation to particular binary, and (4) the role of structure in the organisation of experience and the expression of identity.