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Unraveling the implicit challenges in fostering independence: Supervision of Chinese doctoral students at Dutch universities

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Abstract

Training researchers represents a substantially deeply international activity for higher education, and yet the transition into independence, a critical aim of doctoral education, remains a challenge for both supervisors and doctoral students, especially those from different cultural backgrounds. Interactions between Chinese doctoral students and their supervisors at Dutch universities exemplify the challenges in such an intercultural context. Interviews with 21 Chinese doctoral students and 16 supervisors from three Dutch universities reveal three potential challenges to fostering independence: (1) misalignment in supervisors' and students' conceptualizations of independence due to implicit diversity; (2) misalignment between supervisory support and students' zone of proximal development (ZPD) of independence, as derived from the broader ZPD concept, especially in the first year of the doctoral study; and (3) a gap between supervisors' interpretation of students' visible learning behavior and students' actual concerns. We provide a rich description of these hidden challenges and conclude with a framework outlining the relationships among the three layers of challenges. In so doing, we provide detailed information and a practical tool for supervisors to increase students' awareness and skills, accurately diagnose students' ZPD, recognize and reduce any potential misalignments in time, and thereby support students' transition into independence. We conclude by discussing the practical and theoretical implications of our findings for supervisors and students in other intercultural contexts to reflect on their own practices and explore new ways of promoting international students' transition into independence.

Keywords Independent researcher · Zone of proximal development · Cultural iceberg · Doctoral supervision · Chinese students

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I was thrown into an endless ocean from the first day, I struggled to grab a lifebuoy, but never caught one.... I was panic-stricken. (Student D3).

I had no regular meetings.... I just waited to see how proactive they are, whether they are able to schedule meetings with me and whether they come to complain. (Supervisor S1).

Introduction

The transition into independence is an inherent part of doctoral education (e.g., Åkerlind 2008; Sweitzer 2009), but the journey toward independence is often emotionally challenging. On the one hand, doctoral students often feel isolated and insufficiently guided; on the other hand, supervisors can become frustrated that students depend excessively on them (e.g., Gardner 2008; Lovitts 2008; Mantai 2017). Several factors can challenge doctoral students' transition into independence, such as supervisory style (Hemer 2012); students' personality, motivation, and intelligence (Lovitts 2008); mismatches in supervisor–student goals and expectations (Boehe 2016; Murphy 2009); and how differences and variations are managed (Kobayashi et al. 2017). Adding to this complexity, increasing numbers of international doctoral students, especially from Asia, pursue their doctoral degrees in foreign countries (Kim and Roh 2017; Organisation for Economic Co-operation and Development [OECD] 2016). These international students face the same challenges all doctoral students do, but they experience the challenges more intensively due to the cultural and educational gaps between their home country and the nation where they complete their studies (Manathunga 2011; Winchester-Seeto et al. 2014). Chinese students in particular have gained an inaccurate reputation as passive and dependent in Western academic settings (e.g., Grimshaw 2007; Ryan 2010). Because Chinese students represent one of the largest groups of international doctoral students, examining their transition toward independence represents an important research question.

With data gathered from Chinese doctoral students studying at Dutch universities, we examine challenges in the transition to independence and how supervisors facilitate this process, seeking to reveal the sources of challenges in fostering independence. Though we focused on the specific context of Chinese students taking doctoral studies in the Netherlands, insights into their transition toward research independence may be valuable for students and supervisors in other intercultural settings as well, especially for students from East Asian countries who study in Western countries such as the US and the UK.

Theoretical background

In this section, we describe three interrelated aspects that can give rise to the challenges in fostering independence: implicit diversity in conceptualizations of independence, supervisory support within students' ZPD of independence, and interpretations of learning relative to unarticulated cultural differences.

In Western educational settings, researchers use the notion of independence widely and consider it self-explanatory, even though definitions and explanations of its precise meaning are lacking—similar to the concept of critical thinking (see Tian and Low 2011; Verburgh 2013). Previous research has also revealed variations in the conceptualizations of “doctoral research supervision” (Lee 2008; Wright et al. 2007) and unhelpful mismatches

in conceptualizations within supervisor–student dyads (Murphy 2009). We therefore anticipate that independence has varying connotations among supervisors and between supervisor–student dyads. More differences may be expected in intercultural supervision, due to differences in cultural and educational norms. In practice, supervisory meetings tend to be task oriented, so supervisors and students may not always realize the need to articulate their precise meaning when they speak of independence, and both parties could remain unaware of any potential misalignment in their conceptualizations (Hu et al. 2016a). This situation highlights the need to challenge taken-for-granted assumptions, including that of the “always/already” autonomous student and effective supervisor (Manathunga and Goozée 2007; McAlpine and Amundsen 2012). We thus attempt to deconstruct aspects that implicitly comprise independence in doctoral research and reveal how students’ and supervisors’ understanding of the concept may differ. Relevant studies of doctoral students’ transition into independence implicitly suggest diverse understandings of independence and provide insights into the resources or mechanisms that facilitate students’ transition to become independent researchers (Gardner 2008; Lovitts 2008). However, such studies provide no explicit explanation of the precise meaning of independence. We operationalize independence for this study as the skills, attitudes, and awareness that supervisors or students perceive that an independent learner or researcher should possess.

In addition, if we regard the doctoral journey as a continuous process, students’ level of independence should progress along a continuum from dependence to independence (see also Kennedy 2016; Tannenbaum and Schmidt 1973). Students may differ in their position on the continuum, depending on individual aspects such as intelligence, previous educational experience, and phase of doctoral study; they accordingly need varying levels of supervisory guidance. Previous studies show that too much independence and too little guidance can lead students to consider supervisors unhelpful or irresponsible and that too little independence and too much guidance can prompt students to think that the supervisors lack confidence in their ability or constrain their growth (Gardner 2008; Hu et al. 2016b; Lovitts 2008).

To identify how much supervisory support is needed for successful transitions, we draw insights from Vygotsky’s (1978, p. 86) concept of the zone of proximal development (ZPD), defined as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers.” Although more frequently used in primary and secondary education, the ZPD also can inform teacher professional development (Kuusisaari 2014; Warford 2011) and support efforts for scaffolding critical thinking in higher education contexts (Wass and Golding 2014; Wass et al. 2011). We apply this notion to doctoral students’ transition into independence, which encompasses the learning space between doctoral students’ current level of awareness and ability to act as an independent researcher and the potential level of independent research that can be attained under supervisory guidance (i.e., the space for independent operations should not be vast as to be frustrating, but it should be wide enough to push the student forward in developing independence). The successful progression toward greater independence might depend on how well supervisors recognize and provide guidance within students’ ZPD of independence and thereby help those students expand their ZPD and move toward greater independence.

Beyond implicit diversity in the conceptualization of independence and their varying ZPD, international doctoral students confront a “cultural iceberg” (Hall 1976), which can obscure the depth of their actual independence and prevent supervisors from assessing international students’ ZPD regarding independence accurately. The cultural iceberg refers

to outward expressions or visible learning behavior, often associated with different underlying concerns, reflecting different cultural and educational norms (Hu et al. 2016a, b; Nguyen-Phuong-Mai 2017). For example, silence and hesitation before challenging authority figures might function as behavioral cues of a lack of creative ideas or critical thinking in Western contexts (Robertson et al. 2000), but such behavior also might signal respect for a supervisor, the desire to maintain harmonious relationships, and attempts to avoid any loss of face in Chinese contexts (Hodkinson and Poropat 2014; Ryan 2011; Turner 2006). Intercultural doctoral supervision also frequently involves a “hidden curriculum” (Kidman et al. 2017, p. 1214) that “deals with the tacit ways in which knowledge and behavior get constructed, outside usual course materials and formally scheduled lessons” (McLaren 2016, p. 145). Without concrete cultural knowledge, supervisors may find it difficult to interpret students’ actual level of independence accurately using visible behavioral cues, and students’ actual independence may remain invisible if they are inexperienced in intercultural learning.

Thus, three interrelated aspects can complicate and conceal the challenges associated with fostering independence among doctoral students. We posit that successful transitions into independence require aligned conceptualizations of independence, supervisory support within students’ ZPD of independence, and aligned interpretations of visible behavioral cues and underlying concerns. In turn, our specific research questions are as follows:

- How do supervisors and students conceptualize independence?
- To what extent do supervisors provide guidance within students’ ZPD?
- To what extent does supervisors’ interpretation of visible student learning behavior (mis)align with students’ underlying concerns?

Method

To answer these research questions, we used interview data from a two-phase, larger project devoted to studying the intercultural interaction process between Chinese doctoral students and their supervisors at Dutch universities. The interviews followed the ethical procedures of the Netherlands Code of Conduct for Research Integrity. In semi-structured interviews (50 min to 2 h in length), we asked participants about key challenges they experienced in their intercultural interactions (phase 1) and how they understood the sources of and solutions to those challenges in the intercultural supervision and learning process (phase 2).

With phase 1 (convenience sampling), we sought to gain an overview of key challenges. We recruited participants from personal social networks, including a mix of students and supervisors with differing levels of experience in intercultural interactions. Phase 2 (purposive sampling) aimed to deepen understanding of the key challenges uncovered in phase 1. We obtained support from the director of the graduate school at a Dutch university, who provided a list of potential participants, namely, scholars who had supervised at least one Chinese doctoral student for more than two years and Chinese doctoral students with at least two years’ experience studying in the Netherlands.

The first author conducted the interviews, building on an insider status and intercultural study experience (i.e., Chinese background, obtained a doctorate at a Dutch university). The research team that analyzed the interviews consisted of two Chinese scholars who recently obtained their doctorates in Europe and a Dutch professor who has extensive

experience working with scholars and students from China. Prior to this study, the authors had conducted two reflective investigations into their own intercultural interaction experience (Hu et al. 2016b; Hu and Wu 2019). This background helps enhance the credibility of the analyses and research (see Shenton 2004). As Copp (2008) argues, researchers' knowledge and experience should enhance the quality and depth of the inquiry.

Participants

Altogether, we interviewed 21 Chinese doctoral students and 16 supervisors from three Dutch universities. We gave all participants code names, to maintain their anonymity and avoid any biases that may be triggered by Western- or Asian-sounding names. We used D1–D5 for students not in a supervisor–student dyad, S1–S16 for supervisors, and S1–D–S16–D for doctoral students in corresponding supervisor–student dyads. All students were from China, with no prior educational experience outside China before they came to the Netherlands. With regard to subject matter, 19 students were from science and engineering, one (D3) was studying social science, and one (D4) represented humanities, which reflects the tendency among Chinese overseas students to major in science and engineering (OECD 2016). We included D3 and D4 because they represent a small group of Chinese students. The 16 supervisors all worked in science and engineering departments. They had rich experience collaborating with scholars and students worldwide, spanning seven (S2, S3, S4, S7, S11, S14, and S15) international staff, three new supervisors (S3, S4, and S14), and 13 full professors with extensive doctoral supervision experiences.

Data analysis

We opted for sequential data analysis methods, because different analytic lenses can reveal greater complexity and in-depth understanding of the research questions (Simons et al. 2008). We started with a grounded-inspired strategy (e.g., Glaser and Strauss 1995) to explore conceptualizations of independence. We used Atlas.ti qualitative software (Friese 2015) and followed the qualitative data analysis procedures of Miles and Huberman (1994). We first read through the transcripts and assigned open descriptive codes to text segments in which the participants described what they meant by the term “independent researcher” or what supervisors expected students to do as independent researchers. We then categorized these descriptive codes and discussed and adjusted them until four inter-related themes emerged (i.e., independent technical and practical skills; taking initiative, responsibility, and ownership; independent judgment; and developing own research topic and questions). We revised and adjusted the themes by searching for keywords (e.g., “independent researcher,” “independence,” “critical,” “disagree,” “active,” “initiative”), then returning to review relevant interview fragments and the context in which these keywords were mentioned.

Building on these four themes, we continued with an abductive investigation (Chamberlain 2006; Richardson and Kramer 2006; Timmermans and Tavory 2012) into the complexity and implicitness of the challenges associated with fostering independence. An abductive approach helps maintain the dialogue between the interview data and theoretical presumptions (Morgan 2007). The iterative process (e.g., Timmermans and Tavory 2012; Wright et al. 2007) involved moving back and forth among the codes, the interview texts, and relevant research literature. We paid particular attention to interview segments that described supervisors providing room for independent operation, how students reacted to

being given this space, and the reasons both groups provided for their choices, while drawing theoretical insights from relevant research pertaining to both the ZPD in higher education (Vygotsky 1978; Wass and Golding 2014) and interpretations of learning and cultural values (Hall 1976; Kidman et al. 2017; Nguyen-Phuong-Mai 2017).

In the final analysis phase, we conducted variable-oriented cross-case analysis (Miles and Huberman 1994) to deepen understanding of the relationships among the multiplicity of conceptualizations of independence, ZPDs, (mis)interpretations of visible behavior cues, and fostering of independence. We compared similarities and differences among the supervisors and students. This analysis resulted in a framework with three layers of implicit challenges in the transition to independence by Chinese doctoral students at Dutch universities.

Results

Implicit diversity in the conceptualization of independence

Deconstructing independence: what makes an independent researcher?

The interview data revealed that the notion of independence often appeared self-explanatory and rarely was explicitly explained in supervisory meetings. An implicit diversity emerged in how the supervisors conceptualized independence and how they facilitated its growth. We distilled four interrelated aspects, presented in order of increasing importance and level of challenge for the doctoral students:

1. Independent technical and practical skills
2. Taking initiative, responsibility, and ownership
3. Independent judgment
4. Developing own research topic and questions.

Supervisors prioritized these four aspects differently and varied in the extent to which they expected and supported student independence on each aspect. For clarity, we describe the four aspects separately, though supervisors' conceptualizations of independence often combined more than one.

First, independent technical and practical skills refers to skills such as learning how to use research tools (S11, S11-D), developing research protocols (S13), solving specific research problems (S15), and the ability to "show ... me that you can do it" (S1). Supervisors often mentioned withholding guidance (e.g., "I'm here to help you, but I'm not going to tell you how to do it" [S10]).

Second, taking initiative, responsibility, and ownership refers to students' awareness and ability to take initiatives and responsibility and become owners of their research projects. Doing so may involve initiating supervisory meetings (S1), doing more than what the supervisor told them to do, being curious and wanting to solve something (S6), being proactive and taking the lead in solving problems or making study plans (e.g., S8, S13-D, S15-D), and not just following advice but coming up with questions themselves (S9). In addition, supervisors mentioned owning and taking responsibility of the project, such as, "It's your project, you're responsible that you get your PhD in four years from now" (S10). Similarly, S15 told students, "This is your PhD, not mine.... At the end, you should be the

expert and not me.... I'm here to help you grow into that." Another supervisor explained, "If they don't own the project, they're not motivated enough" (S13).

Third, independent judgment implies that students can independently assess or evaluate others' and their own ideas, which is a form of critical thinking. Thus S14 mentioned the importance of students trusting their own decisions and being able to provide research evidence-based arguments when others or authorities disagreed. In a similar point, S16 asserted that independence occurs when "the students have come to an independent position" so that they can defend their propositions using arguments and results from their research. Students mentioned the ability to evaluate a situation by themselves rather than relying on the evaluation of authorities, such as their supervisors (e.g., D1, D4, S16-D).

Fourth, developing own research ideas means that students come up with ideas of how to continue their research. As S11 stressed, becoming independent meant that students could go beyond what the supervisor told them to do and ask their own questions, "not that you realize my ideas" (S2). For S13, " 'independent researcher' also means that you have to have own input," and S5 concluded, "If we have turned you into an independent researcher, it should be possible to put you somewhere in a department and you do your own research ... but not with so much supervision anymore. You should really develop your own ideas then." Some supervisors (e.g., S7) emphasized this aspect as the most important, and some students also cited it as the most challenging (e.g., S7-D, S11-D).

Invisible (mis)alignment between students' and supervisors' conceptualization

Compared with the supervisors, the students' conceptualization of an independent researcher typically evolved from a simple to complex understanding; thus, most misalignments occurred in the first years and decreased as the project proceeded. At the start of the doctoral program, the majority of the students were aware of having to develop independent technical and practical skills (e.g., how to use certain research instruments or software) but largely unaware of the other three aspects.

Gradually, around the second year, students stopped waiting and actively approached the supervisors when they learned that "it's the student who is in charge, not the supervisor" (S13-D). Thus D4 stated that by "the third year, I became aware that I [had] to take responsibility and self-evaluate the feasibility of my own decisions ... because my supervisor never explicitly told me whether I have made good choices or which method he would prefer. It was all up to me." For S16-D, "I recently discovered that my supervisor was not so knowledgeable; maybe my knowledge has increased.... Most of the questions I asked him, he replied he did not know or was not sure." Perhaps the supervisor was knowledgeable but preferred not to share it, to avoid being the "know-it-all" supervisor. However, few students received any explicit instructions from supervisors regarding why they might deliberately avoid providing direct answers or suggestions. The students acknowledged that the realization process in its natural form was often time consuming and filled with insecurity (e.g., D3, D5, S2-D, S5-D, S6-D, S7-D, S11-D, S13-D), and they expressed a pressing need for some form of training to assist the transition of Asian educated students (D4).

These variations and lack of explicit instruction about independence led to potential misalignment in what supervisors meant and how students interpreted it. As in the case of S11 and S11-D, the supervisor expected the student to ask her own questions, but the student remained unaware of this until the supervisor told her explicitly "that she needed to come up with her own ideas." A student of S10 found it too comfortable and did not see any challenges until the third year, when the supervisor explicitly told her that she needed

to master her own project. Both examples reflect misalignment that occurred implicitly in supervisor–student dyads regarding the precise meaning of independence.

Recognizing the ZPD: What is too much guidance and what is too little?

In principle, each aspect could be placed on a continuum, with supervisor guidance at one end and student independence on the other. Relatedly, the supervisors recognized students' growing independence along this continuum and used scaffolding to support students' growth at different stages. However, they differed in how adaptively and adequately they scaffolded students within students' ZPD, in accordance with students' individual conditions. Consequently, they also varied in how successfully they helped students expand their ZPD and move toward fuller independence.

Our interviews revealed two supervisory norms: one that assumed an active role for students, who would come with questions and ask for help when needed (e.g., D3, S1, S10), and another that assumed an active role of the supervisor in monitoring student progress and adapting supervisory support (e.g., S11, S15, S16). Such norms were often used as a foundation, and then supervisors changed roles if problems arose from the “learn by doing and having talks” (S9) supervision process. Supervisors were able to switch between the two roles and provide support within the students' ZPD, mostly after the second year of doctoral study (e.g., S2, S2-D; S10, S10-D; S11, S11-D; S15, S15-D).

However, other cases revealed a lack of diagnosis or late recognition of misalignments, which often resulted in slow progress or student frustration. This problem typically emerged at the beginning of the doctoral study, when supervisors and students had relatively less intercultural experience. This finding aligns with previous research that identifies such misalignments in many doctoral journeys, regardless of the students' cultural backgrounds (e.g., Gardner 2008; Lovitts 2008). In the following subsections, we address a few representative examples of how supervisory support misaligns with students' capacity and its consequences for student learning.

Recognizing the ZPD: Too much guidance

The first type of misalignment involves excessive guidance about aspects students already know or have experienced, so the students sense too much control and insufficient trust in their research competence. This type of misalignment involves both independent technical and practical skills and developing research ideas. For example, the misalignment between S6 and S6-D pertains to how much room was available for the student's independent operation. Unlike supervisors who stressed that students should come up with their own research questions, S6 provided more guidance.

They write their own proposal ... so I try not to write everything for the student. There are supervisors that just write the complete proposal,... but I want them to buy in, I want it to be their proposal.... You are free to decide on the how you get somewhere, but I want you to get to a result.... We have a lot of rules on paper ... and I expect them to obey them, without [me] looking over their shoulder every minute of the day. (S6).

However, S6-D perceived this regulated independence as limited room for independence, regarded some instructions as unnecessary, and believed “the supervisor already decided how a research [study] should proceed.... Students must listen to the supervisor and do

what supervisors want them to do.” This student had worked in several top research labs in China before starting her doctoral program, so the supervisory support likely fell outside her ZPD with regard to her independent research skills, which she interpreted as an underestimation of her research competence. In response, she adopted strategic compliance while “fighting” for her own ideas. The supervisor considered the student too independent and “very hyperactive, but not really listening carefully.... She is very on her own. And she is hardly participating in group meetings” (S6).

Recognizing the ZPD: Too little guidance

The second type of misalignment involves too little support or guidance from the supervisor on tasks of which students were unaware or unable to accomplish by themselves. This misalignment resulted in students’ anxiety and frustration, which arose frequently in the beginning of the students’ programs, when they were inexperienced with conducting research experiments independently or lacked awareness and skills to take initiative and form independent opinions. For example, supervisors (e.g., S1, S10) expected and waited to see whether students would ask for meetings or come for help; students felt that the supervisor did not offer enough help, such that “We were provided a general direction to go, but [not] what exactly should be done, how to do it. These were all up to us” (S8-D). This lack of direction created insecurity: “I was thrown into an endless ocean from the first day, I wanted to grab a lifebuoy, but never caught one.... I was panic-stricken” (D3). From a ZPD perspective, the supervisors expected students be to proactive and independent at a level the students had not yet attained. Some students may not even have been aware that supervisors expected them to come and ask for help, as S9-D clearly expressed:

Before I have established my own knowledge system, it is really difficult to find a way if the supervisor only provided a general direction. I would certainly hope that he could provide some more specific suggestions ... such as providing a few options that I can look into.

Bridging the gap between visible behavior and underlying concern

Adequate diagnoses of students’ current and potential ZPD of independence also were complicated by implicit cultural differences. A particular visible learning behavior might be misinterpreted by supervisors and students due to differences in their cultural and educational norms. This gap mainly involved taking initiative and articulating independent judgment.

Taking initiative: Asking “stupid” questions

Taking initiative was a common area of misinterpretations with regard to cultural cues. Chinese students tended to believe in the adage “Work hard in silence, let success make the noise”, whereas supervisors typically expected students to ask for help while learning through trial and error. Thus S2-D would only show his work to his supervisor after he had made some progress; otherwise, he would not “bother” her. Meanwhile, his supervisor S2 felt that she had to “babysit them” and expressed deep concern when students did not contact her when experiencing difficulties:

They just think that it is invasive.... I cannot convince them that it is better for them, and it is better for me, because my group is more productive when they tell me immediately when they have a problem. (S2).

Similarly, S8-D noted that he conducted a lot of experiments, but “if I don’t feel the result is good enough, I won’t tell anything about it.” Reiterating this statement, D1 expressed insecurity about asking “stupid” questions: “If I didn’t do well, I feel bad about myself.... It’s kind of losing face.”

The supervisors mentioned coping strategies for such a seeming lack of initiative taking. Initially, S16 thought a student was not proactive enough, due to the limited time she was in the lab, but two weeks later, he was pleasantly surprised by her results: “I was very happy at that moment that I didn’t interfere in that process.” Thus, S16 became aware that some behavioral cues may be unreliable for interpreting Chinese students’ learning. Respondents mentioned other strategies to cope with this hesitation before asking “stupid” questions or exposing weaknesses. For example, D5 mentioned that his supervisor explicitly instructed that the supervisory meeting was not to show off the good results but to share challenges and difficulties; as S9 noted, “The students really have the feeling that they work until they have nice results and then come to you to show the nice results,” so he told students:

It’s a bit dangerous.... If we could have talked ... I can give earlier feedback if it’s good, if there’s an alternative, or if I see a problem ... [which] if they find out six weeks after, they’ve lost precious time. (S9).

To balance between asking simple questions and appearing competent, S14-D suggested:

In the first year, you may ask questions as simple as $1 + 1$ equals 2... People are generally willing to help and thinking you are not stupid but eager to learn. However, you shouldn’t do this after a year.

All these coping strategies can help reveal students’ ZPD with regard to taking initiative, because they make implicit differences explicit. Students typically viewed meetings with supervisors as assessment moments and thus focused on showing how competent they were; supervisors viewed them as monitoring moments in the learning process, which is a “reiterative process of improvement” (S9), so they expected students to ask questions and find knowledge gaps.

Independent judgement: Silent critical thinker?

Supervisors perceived silence and unexpressed disagreement as a lack of opinion or critical thinking; the Chinese students explained that they reacted in silence and kept critical opinions to themselves to show respect to the supervisor or avoid exposing their weaknesses. Unaware of the students’ underlying concerns, supervisors likely underestimated the students’ actual capacity to think critically, as S9 described:

I think Chinese are not very keen on going against you... Sometimes I wish that they would be a bit more critical to me... I sometimes feel that they do what I say, because they regard me as the boss.

Similarly, S2 perceived that S2-D had an “unconditional faith” in her input and thus withheld her predictions about experiments, which she did not mind telling other students. However, through the interview, we came to understand that this seemingly “unconditional faith” may have been rooted in S2-D’s previous experience with his former supervisor in

China, who was demanding and authoritative. Thus, he was accustomed to listening to the supervisor; he was not immediately aware that the supervisor could be wrong and that he was expected to be actively critical of his supervisor's input.

In similar experience, S11 noted that one of his Chinese students followed his suggestions rigidly, even when the student knew the suggestions were wrong, because the way the suggestions were communicated made the student believe them to be "orders" from the supervisor. Thus S11 learned to tell students what to do but not how to do it. As described in the previous section, a lack of supervisory guidance can lead to slow progress and student frustrations; thus, S2's and S11's strategy of withholding their suggestions could fall beyond students' ZPD if students lacked these "how-to" skills. A better strategy might be to seek to understand students' underlying concern. For example, S10 told students, "There is nothing nicer than proving your supervisor wrong," and these students were relatively more direct and expressive in discussing their problems with their supervisor. The supervisors valued and almost took for granted that students would challenge them and express disagreement, which was a relatively new concept for students who had just arrived in the Netherlands. By providing a sort of explicit instruction about such implicit differences, S10 produced a more sensible and accurate understanding of visible student behaviors and supervisory suggestions.

Conclusions and discussion

We conclude by discussing the three layers of implicit challenges in the transition toward independence by Chinese doctoral students at Dutch universities, integrated into a framework that outlines their relationships (Fig. 1). The challenges included (1) how to clarify and align supervisors' and students' conceptualizations of independence, despite the implicit diversity of these conceptualizations; (2) how to balance supervisory regulation and students' independent operation within students' ZPD; and (3) for students with a Chinese educational background, how to bridge the gap between visible behavioral cues and underlying educational concerns. Continual monitoring in these three areas is necessary

Fig. 1 A framework of the challenges in relation to implicit diversity in conceptualizations of independence, the ZPD, and the cultural iceberg in fostering doctoral students' independence

to diagnose students' ZPD of independence and ensure adaptive scaffolding that supports their transitions into independence. We also recognize that these challenges are not solely culturally rooted; they may affect transitions into independence among doctoral students in general (see also Curtin et al. 2013; Gardner 2008; Lovitts 2008; Winchester-Seeto et al. 2014).

Implicit diversity in conceptualizations of independence

The often taken-for-granted notion of independence turns out to be rather complex and implicitly diverse. Our data reveal four interrelated aspects: (1) independent technical and practical skills, (2) taking initiative and ownership of the doctoral project, (3) independent judgment, and (4) developing research ideas. This diversity is comparable to the multiplicity of definitions of critical thinking (Tian and Low 2011; Verburch 2013) and variations in the conceptualizations of doctoral research supervision (Lee 2008; Murphy 2009; Wright et al. 2007). The various aspects of independence thus may overlap with previous findings regarding which resources facilitate students' transition into independent researchers, such as practical intelligence (comparable to taking initiative) and creative intelligence (comparable to independent judgment and developing own research ideas) (Lovitts 2008). Our findings add to existing studies of independence by operationalizing this notion as the skills, attitudes, and awareness to act independently in terms of the four interrelated aspects. Furthermore, we show that the supervisors perceived more aspects of independence than students, at least in the beginning, and that both sides rarely made this misalignment explicit. Some scholars argue that the experience of variations creates learning opportunities that help doctoral students become autonomous researchers (Kobayashi et al. 2017). Clarifying the different aspects of independence thus provides an opportunity to reveal implicit mismatches in how supervisors and students understand independence; in so doing, this research suggests a means to support students' learning and help them become independent researchers.

Challenges in supporting students within their ZPD of independence

Despite supervisors' intention to support students, doing so within the students' ZPD remained a substantial challenge. One reason was that supervisors, who were typically highly experienced and successful in supervision, had established supervisory norms according to their own education and previous supervisory experiences; thus, they generally did not check how their practices aligned with the students' abilities and expectations. Our data show that, especially in the first year, many Chinese students were intimidated by the enormous amount of independence the supervisors gave them. Some students waited and wondered what to do while not knowing that the supervisors expected them to initiate supervisory meetings or learn by trial and error themselves. This finding is mirrored in previous research in which students bitterly conclude that the teachers do not help (Hu et al. 2016b; Mathias et al. 2013). Students' confusion could result from supervisory guidance beyond the students' ZPD; that is, they were expected to be independent but lacked the skills to learn by trial and error.

The students' confusion also could result from the implicit diversity in conceptualizations of independence. Students and supervisors implicitly stressed different aspects of independence, and both remained unaware of the mismatches in their understanding. That is, the first-year doctoral students understood it primarily in reference to independent

technical and practical skills, whereas the supervisors stressed taking initiative. As such, supervisory guidance may have fallen outside the students' ZPD, such that they were expected to be independent in an area in which they lacked the awareness or willingness to do so (i.e., initiate supervisory meetings). Other research cites similar dissonance in general, due to mismatched supervisor–student beliefs and limited explicit awareness of their own beliefs or the beliefs of others (Murphy 2009). Therefore, instead of assuming the term “independence” is self-explanatory, supervisors should explicitly explain its precise meaning and provide guidelines to ensure that their guidance falls within students' ZPD to effectively facilitate students' transition into independence, regardless of students' cultural and educational backgrounds.

Inaccurate diagnosis of students' ZPD may derive from unspoken misinterpretations of visible behavioral cues too (e.g., student silence, hesitation to criticize). Misinterpretations could occur due to a lack of awareness and knowledge about the cultural differences underlying these visible cues, such that both students and supervisors continued to function within their own cultural norms (Ryan 2011). For example, the initial silence and hesitation of Chinese students may derive from their previous educational experience, in which they were accustomed to show respect to their supervisors. Moreover, because the students were likely socialized in a Chinese educational background, they may have had critical ideas but not been readily equipped with skill or desire to express these comments in public (Hodkinson and Poropat 2014). This supposition is confirmed by our finding that supervisory support was most helpful when it addressed the skills needed to express such ideas (i.e., support within students' ZPD). A further reason may be that students perceived their questions, during the learning process, as simple, so they risked appearing incompetent (Hodkinson and Poropat 2014; Watkins 2000). Perhaps Chinese students are more used to “talking of the known rather than talking to know” (Jin and Cortazzi 1998, p. 743) and prefer asking questions after they had learned independently of the teacher (Watkins 2000). In our study, Chinese students tended to perceive the supervisory meetings as moments of assessment and may have been unaware that the supervisors wanted them to ask questions during the learning process so they could detect knowledge gaps and develop ideas further through exchanges.

Implications

This research has several important implications. To ensure supervisory guidance within students' ZPD, we recommend that supervisors communicate the implicit value of asking questions early on and do so more explicitly. Making the implicit explicit may also enhance students' informal knowledge, which helps them cross cultural boundaries and become more articulate about underlying cultural concerns. Lovitts (2008) shows that doctoral students transition more easily when they have acquired informal tacit knowledge about how to do research and be an academic through socialization, such as by doing research as undergraduates or working in an environment with other graduate students. Such tacit knowledge about intercultural supervision and learning can occur beyond formal doctoral programs and may be communicated through “a hidden curriculum” (Kidman et al. 2017; McLaren 2016). However, such hidden knowledge often goes unnoticed in daily practice, and it takes time and continual meta-communication to make the implicit explicit to both sides (Hu et al. 2016b). International students' acquisition of informal knowledge may also be challenged by their lack of geographical access to such knowledge before the start of their doctoral study. The examples detailed in this study thus provide novel insights into

underlying norms for communicating and function as an international doctoral student in a Dutch context. Furthermore, our findings were based on a sample of Chinese students taking doctoral studies in the Netherlands; nevertheless, supervisors and students from other intercultural contexts may draw insights from our findings to facilitate student transition into independence. For instance, it is recommendable to communicate the implicit value of asking simple questions and articulate the underlying cultural concerns when supervising students from other Asian contexts (e.g., Korea, Japan, Vietnam) who study in Western educational settings (e.g., US, UK, Western Europe).

Limitations

Our study participants mainly represent science and engineering disciplines; the findings should be cautiously generalized to other disciplines. Furthermore, we do not assume homogeneity across all Chinese doctoral students and supervisors at Dutch universities, and our findings cannot be extrapolated to the entirety of these populations. Individual conditions such as personality, motivation, and previous educational experience, as well as contextual constraints, all could affect how supervisors support their students and how students learn independence. We also contend that supervisors, regardless of their cultural background, face similar challenges; the cultural differences highlighted herein likely represent potential intensifiers of existing challenges. Continued research should pursue insights into other factors (e.g., individual conditions, contextual constraints) that affect the provision of supervisory guidance within students' ZPD and effective ways to scaffold students' progression into higher level of ZPD regarding independence. We also call for studies that test the conceptual frame proposed herein using other contexts and other forms of research data, such as real-time observations of supervisor–student interactions. Researchers also might operationalize the concepts in the framework as practical tools (see also Wass and Golding 2014).

In closing, implicit misalignment appears common in daily supervisory interactions and at different stages of students' transition into independence. Therefore, university management should provide explicit instruction, during professional development efforts for supervisors and academic bridging programs for students, to increase their awareness of and ability to recognize and reduce potential misalignments. We also recommend exploring other support mechanisms for recognizing and reducing potential misalignments between supervisors and students, such as creating partnerships between Chinese students and Dutch doctoral students or having a Chinese co-supervisor to act as a mediator to clarify expectations for both sides.

For supervisors, our results suggest the need to begin with an open exchange of ideas with students regarding potential misalignments, including those involving the implicit diversity in their conceptualization of the four aspects of independence. Explicit communication in these areas may benefit supervisors and doctoral students in general, regardless of students' cultural and educational backgrounds. Second, supervisors should continually check students' ZPD of independence and apply adaptive scaffolding to support their transition into independence. For example, to foster independent technical skills, it would be sensible to provide concrete suggestions and options when students embark on completely new research tasks. To foster Chinese students' independent judgment, supervisors should explicitly explain the value and role of "stupid" questions and emphasize how some visible behaviors are typically (mis)understood in the Western educational contexts, which typically differentiate the noncritical thinker, silent critical thinker, and active critical

thinker. In turn, supervisors could provide guidance more effectively within students' ZPD. Because students' ZPD is emergent and dynamic, supervisors also might apply the conceptual framework we propose to perform dynamic diagnoses of students' ZPD and adaptively scaffold students' transition into independence. Students also could use this framework to self-diagnose their ZPD and seek challenges and supervisory help accordingly. We also encourage supervisors and students in other intercultural contexts to use this framework and the detailed examples to reflect on their own practices and explore new ways of promoting international students' transition into independence.

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Compliance with ethical standards

Conflict of interest There is no potential conflict of interest.

Informed consent Informed consent was obtained from all participants using the "Form for informed consent concerning human participants research (update: February 20, 2013)" provided by Faculty of Behavioural and Social Sciences, University of Groningen.

Ethical approval Ethical approval was obtained from the Ethics Committee of the Teachers Education Department, University of Groningen (EC Ref No: 2017/1).

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