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DOI:

[10.1111/1467-9752.12245](https://doi.org/10.1111/1467-9752.12245)

Document Version

Peer reviewed version

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Citation for published version (APA):

Winch, C. (2017). Knowing 'Wh' and Knowing How: Constructing Professional Curricula and Integrating Epistemic Fields. *JOURNAL OF PHILOSOPHY OF EDUCATION*, 51(2), 351–369. <https://doi.org/10.1111/1467-9752.12245>

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Knowing 'Wh' and Knowing How: Constructing Professional Curricula and Integrating Epistemic Fields.

I. Introduction:

This paper is concerned with the interpretation of professional curricula and qualifications in the light of the debate between 'intellectualists' and 'anti-intellectualists' concerning whether or not know-how is a species of propositional knowledge (e.g. Stanley and Williamson 2001). It argues that a central claim of intellectualists, that 'knowing wh' constructions are to be construed as only expressive of propositional knowledge is false. As professional educational examples make clear, not only are such constructions pervasive in curriculum and assessment documents but they often refer to cases of know-how. In fact, both the 'know that' and 'know how' interpretations of knowing wh are closely connected in professional education and this is essential for our ability to place our trust in such qualifications. This will be shown through examples. Neither intellectualists nor anti-intellectualists can give us an adequate picture of how such constructions work, let alone the work that they do in professional education. Not only should this should prompt a rethink in mainstream epistemological debate about the role of Knowing Wh, but it should also make curriculum designers and assessors more aware of potential ambiguity in their documentation.¹

Much debate on the nature of knowing how (KH) has concerned the status of 'knowing wh' to support the claim that KH is a form of propositional knowledge (KT), since knowledge expressed in 'knowing wh' constructions is propositional knowledge and a proper understanding of KH itself involves understanding it as a form of knowledge expressed through 'knowing wh' constructions.

This paper will look at the implications of a clear view of *Knowing Wh* for professional and vocational education. Knowing Wh is a category of interest not only to philosophers but also to educators. I will argue that the treatment of Knowing Wh by educators and professionals has significant implications for philosophical treatments of Knowing Wh. In turn, philosophical debates on the nature of Knowing

Wh have a bearing on our understanding of the way in which KH is conceptualised in professional curricula.

Educators of professionals want to know whether or not someone knows how to operate in a professional field of activity, and with how well they know how to. They also want to have a clear view of the elements of professional knowledge and how they relate to each other. They are often thought of as more than a bundle of skills but as a wide-ranging competence (Hanf 2007). Generating answers to such questions helps us to understand the relationship between different modes of knowing: propositional knowledge (KT) and KH.² These modes of knowing are distinct but closely related epistemic abilities and in assessing professional capacity we often find them together as part of an overall professional competence. When we examine professional competence, we are obliged to make distinctions which suggest that there are closely related epistemic powers exercised as part of that competence. But, as we shall also see, the tripartite epistemic classification outlined above needs some modification, particularly when we consider judgement.

Linguistic ambiguity, particularly in English, compounds the difficulties and has implications for the design of professional curricula and qualifications. One can see this in the case of curricula that do not make explicit reference to the theoretical and practical aspects of content. For example, in the BTEC National in Construction it is stated that the candidate must be able to apply 'knowledge and understanding to the range of content' without stating whether this involves action or giving an account of what the candidate would do (BTEC 2003, p.31). Rumfitt (2003) drew attention to the ambiguity in the English construction 'to know how...' and its cognates and the fact that it can mean 'to be able to do F' and 'to be able to give an account of how to F'. However, there is a much wider range of ways of expressing epistemic attributions that further complicate discussion. Since these constructions commonly occur in professional curricula and assessment instruments it is important to interpret them properly. In much of the literature, KT is said to be very often expressed in 'Knowledge Wh' constructions and some commentators assume that such constructions invariably refer to KT, including constructions which involve 'knows wh'(Schaffer op.cit., Stanley and Williamson op.cit., Farkas (2016). Knowledge Wh (KWh) constructions include:

- 1) A knows when to F.
- 2) A knows where x is located.
- 3) A knows whether B is lying.
- 4) A knows why the ship sank.
- 5) A knows who defrauded the bank.
- 6) A knows how to tie a reef knot.
- 7) A knows what is best for B to eat.

Such constructions do indeed often express propositional knowledge. However, matters are more complex and professional educators need to take account of this. This is particularly clear for those professional qualifications that assume competent practice as an assessment criterion. We will see several examples of this in the concluding section.

KWh constructions.

One important feature of KWh constructions has been little observed. They are sometimes capable of taking what Ryle (1949) called ‘intelligence epithets’ or evaluative adverbs or adverbial phrases. They are important in professional assessment when one wishes to grade performance or knowledge., as in the case of the BTEC Construction curriculum referred to earlier. Thus one can say:

- 8) A knows more or less when to sound the alarm.
- 9) A knows exactly where the treasure is buried.

One of Ryle's central claims was that intelligence epithets apply only to KH constructions. But if KWh constructions express KT and they also take intelligence epithets, then Ryle's distinction in philosophical grammar between KH and KT constructions may no longer hold. I will explain and defend three theses bearing directly on the way in which we handle KWh constructions in professional education.

Thesis 1: *KWh claims are often ambiguous between KH (and related forms) and KT. Such ambiguities in KWh claims can be disambiguated through context, exemplification or explanation.*

Thesis 2: *Some forms of knowing wh can be understood in both KT and KH senses and also in a Knowing To sense, closely related to but not identical with KH. Disambiguation depends critically on which aspect of a professional capacity one is looking at.*

Thesis 3: *Both KT, KH (and related) forms of KWh) have to be taught and assessed in an integrated manner in professional contexts.*

Thesis 1:

First I present an outline of the case made by propositional intellectualists such as Stanley and Williamson, that KWh constructions express propositional knowledge.

1] A claim to propositional knowledge can be put in the form of an embedded question. 'W is the way to ensure effective building insulation' is the answer to a question of the form 'What is the way to effectively insulate a building?' Thus a 'knows what' claim is a claim to have propositional knowledge. One objection is that to show that one knows the answer to an embedded question is to demonstrate an ability (to answer the question) and thus a form of KH. However, if KH is really KT in a practical mode of presentation then this objection can be dismissed, since it is unreasonable to expect the answer to a question always to be offered in the form of an assertion. Norman Malcolm (1977, esp.pp.224-225) pointed out that the question 'Where did Daddy leave the shovel?' could be answered by son Jerry running to the dogwood tree and picking it up.³ Knowledge of the answer can be expressed

practically and a third person report that Jerry knew where Daddy had left the shovel would normally be correct. However, the coherence of the idea of a practical mode of presentation of propositional knowledge needs more scrutiny.

2] KWh, like KH claims, can be asserted as responses to an embedded question. Both can also be expressed in a practical mode of presentation.

3] So there is good reason to think that KH is a subspecies of KWh, since KWh claims are also responses to embedded questions as in Malcolm's example, and KH claims can be rendered as responses to embedded questions as in the Ship Inn example. Jerry's action is an answer to the embedded question 'Where did Daddy leave the shovel?' and expresses the proposition that *Daddy left the shovel leaning against the dogwood tree*, just as using correct procedures in insulating a building expresses the claim that *A knows that w is the way to effectively insulate a building*.

4] So it looks as if any attempt to show that KH is not a form of KT would also show that other KWh cases are also not examples of KT. But we are happy to treat these kinds of examples as KT.

5] Since it is clear that KWh cases are cases of KT it cannot be the case that KH is not KT, since KH constructions are themselves a form of KWh construction, answers to embedded questions.

The general form of the argument is that KH claims are a form of KWh claim, and since KWh claims are a form of KT claim, then they too are a form of KT claim (see Farkas op.cit. pp.109-110).

Response.

The argument assumes that because some forms of KWh can be rendered as answers to embedded questions and thus as examples of KT, all can.⁴ While it is true to say that Jerry knows how to effectively insulate a building, we assume that he would be able to assert this if asked.⁵ However, it does not follow that if Tom knows that *w* is a way to install a light socket, then he should be able to assert what this way is, if asked. If Tom knows (in a practical mode of presentation) that *w* is a way to install a light

socket , then although we can say with confidence that he knows how to do so (if he can do so repeatedly and in varied circumstances, see Hornsby 2011), we would hesitate to say that he knows that *w* is a way to install a light socket if he is unable to give a satisfactory account of how to do so in a context where such a response is expected, for example in a formal assessment of competence.⁶ There are many cases for *knowledge that* claims where we expect an account or an assertion plus justification by A to be confident that A knows that *p*.⁷ Why?

One reason is that propositional knowledge does not usually come in proposition-sized chunks but is connected with other knowledge making single propositions intelligible within a topic or organised subject. If someone is unable to make these connections, then we may doubt whether they actually know what they claim to know, as opposed to being able merely to assert it. This is connected with the familiar idea that knowledge requires justification. If I claim to know that *p*, I should be able, if asked in a professional context, to justify my claim.⁸ So, although we should accept that KT can often be expressed practically, we should be more wary of the claim that actions expressive of KT always constitute a fully fledged knowledge claim and that we are always entitled to attribute *knowledge that* on such a basis.⁹

The second point is that KWh attributions are not always unambiguous with respect to their propositionality (Bengson and Moffett 2007, 2011b). English uses the various KWh as well as KH constructions in different ways which are usually disambiguated through context or questioning. Thus *Tom knows how to ride install a light socket* can mean both that he is able to do so and that he can give an account of how to do so. In German this is marked by the *können/wissen* distinction and in French by the *savoir comment faire/savoir faire* distinction (Rumfitt op.cit.). These distinctions apply to KWh constructions.

To take an example which can easily be extended across other KWh cases:

10] A (a heavy goods vehicle driver) knows when to apply the brakes

Can mean:

11] There is a time *t* and A knows that the brakes should be applied at *t*.¹⁰

or

12] A knows how to apply the brakes at an appropriate time.

or

13] A knows to apply the brakes at an appropriate time.¹¹

11] normally implies that there is some time *t*, and A knows what it is. Thus if A knows what that time is, he also knows that the brakes should be applied at that time, without implying that he *can* apply the brakes at that time. It can also mean that A can recognise that time when it occurs, because it is expressed by a description and A can recognise that time when it falls under that description. In this case there is a *t* which A knows, which falls under a description eg. ‘when the road becomes slippery’ rather than being a direct temporal designation. Again, this does not imply that A is able to apply the brakes at that time. 12] suggests that whatever the appropriate time is, A can apply the brakes at that time even if s/he cannot assert that *t* is the time. The element of generality is important, as KH attributions if they are correct, need to apply to multiple instances with varying circumstances, not just once.

How do we know whether 10] should be understood as 11], 12] or 13]? The context is important. In an examination, the appropriate answer is usually 11]. In a practical test, the answer is usually 12] in a *post facto* assessment or enquiry, 13] might be most appropriate. In everyday practice, we rarely have difficulty in making the appropriate judgement. In the context of teaching and assessment however, it is important that there be no ambiguity about which sense is meant and further explanation may be necessary, for example in curriculum or assessment documents. As we shall see, this is often not the case. We can say, therefore, that some KWh is clearly KT and some is KH or closely related to it.

However, Stanley and Williamson would say that both are cases of KT. What appears to be KH is really KT in a practical mode of presentation in the latter case. Thus in the first case (11]) there is a *t* which A knows, which could be elicited from A. In the second case (12]), A can simply apply the brakes appropriately and the 3rd person attribution, ‘A knows that *t* is the time to apply the brakes’ is correct. But this does not entail that A knows how to apply the brakes at a particular time that he can articulate, either through specifying a time or describing when it would be

appropriate. So it looks as if in this case A knows how to apply the brakes at the appropriate time, but cannot assert that t (or a description thereof) is the appropriate time. The 'practical mode of presentation' of

A knows when to apply the brakes

is therefore not equivalent to the corresponding assertions which express what time A thinks is appropriate (with appropriate justification if required). It is not possible to infer KT from action which is consistent with the possession of KT but which does not possess its characteristic 1st person features.¹² In the third case (13]) we may be interested in the element of judgement that resulted in A applying the brakes rather than his ability to actually apply them. Is there evidence that he made a correct judgement to apply the brakes in this instance?

This suggests that KWh constructions should not always be read as KT. In appropriate contexts they have a valid KH interpretation. This is important in cases of professional action. This concludes the preliminary case for Thesis 1, that KWh and KH constructions can be ambiguous between KT and KH interpretations and can be contextually disambiguated. We still need to ask how such disambiguation can take place. There is no single answer to this question. Apart from asking someone who makes a claim in which sense s/he meant it, it is also possible to judge which claim makes most sense in a particular context, where for example *acting* rather than *saying* would look like a misinterpretation of what was asked for.

Thesis 2: Some forms of Knowing Wh can be understood in both KT and KH (and also in a Knowing To sense, closely related to but not identical with KH) senses for some forms of professional knowledge, depending on which aspect of a professional capacity one is looking at.

Professional ability usually involves the application of systematic KT to KH. This is particularly clear in the German *Facharbeiter* stratum of the economy, if much less so in sections of the UK labour market (Hanf 2011, p.55; Brockmann, Clarke and Winch 2010, p.43). In order to understand professional know-how fully, we need to distinguish between KH as an assessable skill (weak sense), related to a type of task

such as installing the wiring in a room according to a diagram, from professional know-how as a theoretically informed wide-ranging ability (strong sense), such as being able to plan and carry out the rewiring of a building. In this stronger sense would be incorporated second order abilities such as *planning, controlling, communicating, co-ordinating* and *evaluating*, and they are usually combined in a recursive third-order ability of *project management* as in the example above (Winch 2014). Thus, if a qualified plumber is able to repair a defective house drainage system we would expect the ability to manage this as a project based on the ability to plan etc.

Professional education has to be able to develop KH in both strong and weak senses. Abilities such as planning involve the exercise of skill, but are not completely explained by them, since they can be instantiated through different skills in different contexts. Neither is the exercise of relevant skills a sufficient condition for the exercise of a second-order ability, since if undertaken without sufficient attention or seriousness of purpose, the skill will instantiate a ‘seeming to’ act without an actual manifestation of the ability in question (Hasselberger 2014, esp.p.153). Not only are there multiple ways in which the ability may be exercised, but there can be cases where there is no way *w* available and exercise of the ability in question involves the ability to *find* an appropriate way. In the example above, a plumber may attempt various diagnostic techniques which do not identify the defects. In these circumstances s/he will have to devise a way of identifying the defects. Here theoretical knowledge of the principles underlying plumbing and drainage systems will be critically important.¹³

Both first and second order know-how often involve the application of systematic propositional knowledge (KT) to action, so that the professional know-how is itself partly constituted by a judgemental ability which involves the ability to infer one proposition from another. For propositional intellectualists this would involve bringing KT in a non-practical mode of presentation to bear on KT in a practical one (KH in their sense). This is assessable through carrying out actions of the relevant type, but such assessment cannot usually be sufficient, since there are insufficient circumstances in which the ability can be exercised to allow for valid assessment. This is particularly so with second-order KH where the actions required may differ

significantly from context to context, for example a nurse communicating with different patients with different needs. It becomes necessary therefore to ask questions of a candidate for a professional qualification to ascertain how they would act in certain circumstances. In other words, ability to give an appropriate account of action in a hypothetical situation would be a necessary condition of ascribing the ability to the candidate. We thus need a combination of abilities: the ability to act appropriately and the ability to give an account of how one would act appropriately. This gives us trust in the professional's know-how (Kotzee op.cit.).¹⁴

Much application of KT to KH is the application of one form of KWh to another. Thus A knows propositionally the circumstances in which to apply the brakes (either under a description or referring to the name of a specific place or time) and is able to apply them in those circumstances. For example, as part of his/her theoretical knowledge as a train driver, A knows that you apply the brakes to reduce speed when approaching a bend of radius smaller than x metres. A might also know that *this place* is where the brakes should be applied (particular knowledge relating to a route). If A actually knows how to apply the brakes as well, s/he is thus able to apply the brakes in appropriate circumstances. It can be expressed as *A knows to apply the brakes* or, alternatively as *A knows when to apply the brakes*. Either of these constructions will do providing we recognise the complexity of the case. It involves the following abilities: recognition that the train is faced with a tight curve, forming a judgement in relation to a theoretical proposition and a perception, and the physical ability to apply the brakes in the relevant situation. Two of these sub-abilities are forms of know how¹⁵ and the whole statement, *A knows when to apply the brakes* can correctly be characterised as an attribution of KH to A. Similar points can be made about administering a dose, intervening in a discussion, casting a fishing line etc.

To generalise: for many cases of KWh construction,

A knows that t is a time to F is the right reading (theory T may prescribe this). This works both for direct reference and description cases.

For other cases,

A can F at an appropriate t is the right reading (situational considerations demand it).

And it can also be the case that

A can F at an appropriate t

Because

A knows that t is a time to F and situational considerations, in conjunction with T, suggest it.

In such cases, professional education involves learning knowing when, where, how, whether to apply T.

Such knowledge can be assessed in both a practical and a theoretical context. Thus the German standards for schoolteachers indicate the criteria for both the practical ability required and for the hypothetical circumstances where we would like to know how a teacher would act (KMK 2014, eg.p.13). We often need to know, not merely that A knows when to make use of relevant educational research in their classroom work, but that A has a good understanding of the conditions under which it is appropriate to do so, and can also acquaint himself with those conditions. Professional know-how, which involves applying both theoretical and specific knowledge to complex and changing operational conditions, demands assessment in both practical and propositional modes, as well as acquaintance with appropriate circumstances, instruments, etc (see also Winch 2016).

Couching assessments in KWh phrasing is important in dialogical terms, as it indicates not only that a statement or action is required in response, but also that the answers lie within a certain range relevant to the question asked (Schaffer op.cit.; Farkas op.cit. Without committing ourselves to the view either that propositional knowledge is intrinsically dialogical (Schaffer) or that KWh is *sui generis* (Farkas) we can nevertheless acknowledge that KWh locutions focus the demand for knowledge on specific areas and procedures. In cases where a KWh request clearly requires an

answer in the form of an action, we understand the general form of the action and the context in which it is required.

Thus **Thesis 2** is supported.

Thesis 3: Both KT and KH (and related) forms of KWh have to be taught and assessed in an integrated manner in professional contexts.

It follows that professional education has got to articulate the theoretical and practical aspects of the relevant occupation, as well as particular propositional knowledge associated with the circumstances in which the occupation is practised. This is a challenge because most occupations really do involve at least two different kinds of knowledge which have to be integrated. The mode of integration involves *explanation* reinforced by practice. But the power of explanation is an ability and hence a form of know-how characterised by:

Ability to give an account of how (generic) F is done which could include:

When it is done

Why it is done

In what manner it should be done

To whom it should be done

Where it is done

Whether it should be done

This indicates that an observer can evaluate *how well* A knows how to F. Hence the explanatory ability of A has the characteristics of KH, both in explaining when, why, and whether F should be done and in giving a good account of how to F, while at the same time demonstrating knowledge of many propositions. These in turn are integrated through a network of conceptual and empirical connections which A must have mastered in order to achieve expertise, both in the theory underlying the practice and in being able to justify and explain actions and decisions taken in professional contexts. A's explanatory ability involved in showing how mastery of a body of systematic knowledge is relevant to professional scenarios, is itself a form of KH.

We should note, however, that it is possible to attribute KT in a formal sense to someone who is able to perform an action which involves a way of performing that action. Thus, if John is able to ride a bicycle, we can say that John knows that *w* is a way to ride a bicycle. In itself, there is nothing wrong with this locution. But there is plenty wrong with it if we conclude from the observation that A knows that *w* is a way to ride a bicycle, that A is able to assert in appropriate circumstances that *w* is a way to ride a bicycle. In many professional contexts to say that someone has propositional knowledge is, minimally, to attribute to them the disposition to assert and justify the relevant proposition on appropriate occasions. In this instance possession of one ability is not a condition of the other and *vice versa*, suggesting that we are not here dealing with identical items of knowledge expressed in different modes of presentation. The two are distinct abilities which need to be integrated in professional contexts.

It follows that our knowledge of someone's professional capacities depends on our being able to ascertain and evaluate actions that they take, both practical and more theoretical, like explaining and justifying how or why one would act in a certain way in certain circumstances. Where only third person attributions using the 'knows that' locution are possible, then we cannot confidently attribute KT.¹⁶ We should therefore refrain from attributing KT in professional contexts to someone who can practically demonstrate a way of doing something unless they can also give an account of how and why. We want to satisfy ourselves that they understand what they are doing and why. The point can be made even more strongly for attempts to assess how well someone can perform, which often involves the use of Rylean intelligence epithets (eg BTEC 2008, pp. 41-42).

Neither should we assume that being able to give an account of how something is done necessarily gives us grounds for assuming that someone has the appropriate underpinning knowledge for practising an occupation. It is likely that a body of systematic knowledge will provide the underlying rationale for professional action. Such knowledge may derive from disciplines such as mathematics, chemistry or psychology and will need to be interpreted in the light of particular professional circumstances. Furthermore, knowledge of particular circumstances and processes

may be required in order to act appropriately. Translating this systematic and non-systematic knowledge for assessment purposes into attributes necessary for professional action will include Knowledge Wh statements such as the agent knows *whether or not* to act in a certain way, *why* it is necessary or appropriate to do so, *when* and *where* it is necessary or appropriate to do so, which can be tested practically through eliciting actions from the candidate.

Given that we will very often also wish to know how the candidate will act in hypothetical circumstances, it will be necessary to elicit a first person account of *whether, why, when, where* and *how* they would act in such circumstances. These can also be subject to evaluation for the quality of the KH demonstrated. Thus, it is possible to say that A knows *where* to apply the instrument correctly through a demonstration of actually doing so. The propositional analogue would be where A asserts that *p* is a place where the instrument should be applied. He is said to know this if he can answer a question correctly (an ability). In this case we do not say that **A knows correctly that p is a place to apply the instrument,*¹⁷ although we can perfectly well say that *A knows how to apply the instrument correctly at p.* Ryle's point, that intelligence epithets are applicable to KH constructions but not to KT ones holds in the case of KWh once disambiguation has been effected. In such a case, we have no other way of knowing whether A knows how to apply the instrument correctly, than by gauging whether he knows where to apply the instrument in hypothetical circumstances C. But we can only make this inference securely, if we are already satisfied that he knows how to apply the instrument in other circumstances, that he has sufficient confidence, hand-eye co-ordination, manual dexterity etc. When the KT interpretation involves systematic knowledge a description is usually appropriate. Thus *A knows when to apply the brakes* is interpreted as *A knows that the brakes should be applied in circumstances C* (which, for a locomotive driver can include track radius, speed, weight of the train etc.). Assuming a theoretical element to driver professional training programmes, A's systematic knowledge relating to physics and track geometry is relevant. This can be contrasted with an interpretation referring directly to a place or unit of time, as in *A knows that the brakes should be applied when travelling at speed $\geq S$ at the Keystone Corridor*, an item of specific route knowledge. A, the driver, whose train is travelling at $\geq S$ at the Keystone Corridor, is able to apply the brakes (KH) because general considerations of physics

and track geometry indicate that this is appropriate knowing that his train is approaching the Keystone Corridor.

One could say, along with Stanley and Williamson, that A knows that *w* is a way of applying the brakes in these circumstances *in a practical mode of presentation*, but this reading of A's professional knowledge looks forced. First, using the way *w* locution is inappropriate, since the critical part of A's professional knowledge is not the way in which the brakes are applied, but the ability to make the right judgement. One can also say that the driver *knows to* apply the brakes on the curve (Wiggins 2012). This in turn means that the driver can make the correct judgement that the brakes should be applied *here* and that he knows how to apply them correctly. It is misleading to say that the driver knows how to apply the brakes here since it is not just a matter of physical know-how rather than judgement. Without 1st person testimony, it would be misleading to say that he *knew* that *this* was the place to apply the brakes except in the limited sense of attributed 3rd person knowledge. It is less problematic to say that he was able to make the right judgement in these circumstances. If need be this ability can be explained by A's *knowledge that* relating to time, place and theoretical considerations, not by his knowledge of how to apply the brakes, which would be taken as presupposed.

In this case as in so many others relating to professional action we are dealing with judgement as much as with physical capacity, the ability to make appropriate judgements involving the connection of general with particular knowledge and recognition of appropriate circumstances. Judgement, itself a developed ability, integrates KT (general and specific) and acquaintance knowledge (KA) (recognition that these are the appropriate circumstances requiring the judgement and subsequent action) and action (itself requiring know how).

This example is relatively simple but illustrates that the epistemic capacities required are closely related and need to be taught in an integrated way to ensure that A drives safely and efficiently. The point applies *a fortiori* to more complex forms of professional judgement. Thus **Thesis 3**, that both KT and KH (and related) forms of KWh have to be taught and assessed in an integrated manner in professional contexts is supported. We have also noted the inadequacy of conceptualising all KH solely in

terms of *ways* and have shown that the practical mode of presentation of an item that can be described tendentiously as a form of 3rd person KT can actually be more complex than the intellectualist account allows for.

Conclusion.

The final task will be to draw out the implications of this analysis of KWh constructions for professional curricula, pedagogy and assessment. Thesis 1 (T1) establishes the KT/KH ambiguity of many KWh constructions. Thesis 2 (T2) establishes that in professional contexts KWh constructions can be ambiguous and often susceptible of KT and KH interpretations which are related to each other. Thesis 3 (T3) indicates that in educational terms the KT and KH elements embodied in KWh requirements need to be taught and assessed in an integrated way.

What are the implications for professional curricula? Both T1 and T2 alert us to the need for both *differentiation* of KT and KH elements in curricula and for their *integration* to develop appropriate forms of professional judgement and action (T3).¹⁸ This does not simply mean a division between knowledge and skill as is often found in such curriculum schemata, but a broader division between knowledge that (which includes systematic as well as particular knowledge) and various forms of know-how, including transversal and project management abilities which cannot be easily accommodated as forms of technique. Crucially, it also involves the development of a capacity for judgement closely linked to action. T3 shows that the different epistemic modes need to be carefully related to each other to promote professional action and judgement and their relationships made clear within curriculum documents. It is probably necessary to show clearly, perhaps in tabular form, how certain higher level specifications of professional capacity should be manifested in both practical and theoretical modes, as with the German competence specifications for teachers.

T3 has clear implications for pedagogy, and suggests that professional judgement has to be developed through carefully integrated and interwoven sequences of instruction, simulated practice, practice in operational conditions and *post hoc* reflection. Assessment instruments, vital for licensing of professional practice, will need to reflect its complexity and take account of the varieties of circumstances in which

professional action and judgement will be required, including those that cannot be directly assessed. For these cases a ‘thin’ 3rd person manifestation of KT will not be appropriate as assessors will want to know how agents think that they should act in certain hypothetical circumstances and for this their own words are necessary.

Consideration of the ambiguity of KWh constructions within the broader epistemic framework constituting the field of professional judgement and action, leads to the view that the framework of professional curricula, which has consequences for pedagogy and assessment, necessitate both differentiation between and integration of the different epistemic elements. A tabular organisation can go some way towards doing this, particularly for differentiation, but the integration of complementary elements poses a challenge for perspicuous curriculum design for occupations of complexity.

These points can be illustrated by looking at some contemporary professional qualifications in the UK. Associated assessment criteria will refer to items of propositional knowledge, acquaintance, know-how or understanding which jointly will enable an assessor to determine whether an assessment criterion has been met. As the literature on KWh suggests (e.g. Schaffer op.cit.), one may expect Knowledge Wh statements or questions to occur within a context of presupposition, such as is provided by the specific content of the qualification in a particular area or in assessment criteria.

One should expect qualification documents to be sensitive to the broad epistemological distinctions between propositional, practical and acquaintance knowledge. However, some finer grained distinctions are not always observed. This poses a potential problem for the understanding and interpretation of such documents particularly when, as in the examples below they rely on statements of learning outcomes rather than specifications of curriculum content. I will illustrate some of these, show where they are addressed in assessment criteria and where they need to be addressed in assessment instruments. I will bring out the practical implications of Thesis 2 which leads on to the implications of Thesis 3 for qualification design and assessment. In doing so, we shall see that Thesis 1 concerning the ambiguity of KH/KT attributions is not always dealt with in these documents.

How is the KH/KT distinction dealt with in Learning Outcomes (LOs) and Assessment Criteria (ACs)? Although the distinction is not usually made explicitly, it reveals itself in the assessment criteria related to the LO. Thus for example in the C&G Extended Diploma in Agriculture Unit 3 ‘Understanding the Principles of Plant Science’ LO2 states that the candidate should be able to *understand the functions of plant structures* and be able to *explain the function of the major plant structures* (AC2) (C&G 2012a). This would clearly count as a case of KT, but note: first, *explanation* does not involve the assertion of a series of propositions, but the coherent ordering of related propositions to demonstrate some element of plant biology. The candidate demonstrates knowledge of plant structures through the *ability* to explain their functions. Second, the explanation has to be given in the first person: it is not enough to demonstrate knowledge of the function of plant structures through activities which demonstrate that knowledge.¹⁹

How is KH dealt with in learning outcomes and assessment criteria? KH formulations are sometimes actually KT items, where knowing how to F means *being able to give an account of how to F*. Thus the CG level 3 Diploma in Waste Management has as LO: The learner will: *know how to monitor procedures to safely control work operations* (C&G 2012b). The assessment criteria all involve explanation and description, rather than monitoring activities *per se* (p.42). On the other hand there are cases where it is obvious that a KH learning outcome involves performance of the relevant actions. Thus, in the Extended Diploma in Agriculture, LO1 of *Undertake Agricultural Crop Production*, namely *Know how to establish crops* involves, as well as explanation and identification, the ability to *Select appropriate equipment for seedbed preparations*. There is a close relationship between these two kinds of KH assessment criteria and there is a good reason for this when assessing someone’s ability to act successfully in an occupation. In this example the assessment criteria imply that the candidate *knows what* equipment to select and s/he does this in a practical sense, i.e. by actually selecting the correct equipment. Thus, Thesis 1 that KT/KH ambiguity is resolvable by context is supported, although this is far from ideal in a qualification document.

Specification of KWh instances which are KH examples are quite easy to find in qualification documents. Thus in the C&G Level 2 Diploma in Health and Social Care the candidate is expected to: *be able to work in partnership with others* and this in turn involves the ability to *demonstrate how and when to access support and advice* over various matters (C&G 2015a, p.49). This is a case of knowing how and when in a practical sense through professional action. In the C&G CNC Manufacturing Engineering Qualification at Level 3, we find that the candidate should be able to *seek out additional information where there are gaps and deficiencies in the information available* (C&G 2011, p.24). On the one hand, it can mean that the candidate knows how to find such information, on the other it implies that the candidate *knows where* to look for it in a practical sense, either in general terms or in terms of a specific location. Incidentally, this implies that the candidate does not know where the additional information is unless they are actually able to seek it out in the ‘achievement’ sense (see Farkas op.cit. Section 3).

A final example comes from the C&G Level 2 qualification for Dental Nurses. A candidate should be able to: *process and store dental records, charts and images in a way that protects their confidentiality* (C&G 2015b, p.52). The candidate has to know what to store and where in workplace conditions, manifesting those abilities practically. Arguably this ought to be supplemented by some explanation of why.

Know-how attributions concern action types, albeit with token variations. It is thus impossible to assess someone’s complex ability only through observation of action in limited circumstances. The candidate needs to also explain or describe how they would act in a range of circumstances before a safe inference can be made to possession of the relevant know-how. Thus in the Diploma in Agriculture we find that the candidate should *identify the factors which limit the rate of photosynthesis*. (p.47). This example of *knowing which* could be assessed through practical agricultural activity such as selection of planting locations, but this would not provide the assessor with sufficient evidence of the ability, which would need to be supplemented by a description of those factors and an explanation of why they were factors. In practice, professional know how, including its KWh manifestations, requires dual validation in both action and description/explanation, bearing out the claims of T2 and T3, that

KWh has to be understood in both KT and KH senses and that they should be taught and assessed in both.

These points are evident when we consider qualifications from the practical point of view, whether they provide a guarantee of the holder's ability to operate in a complex occupation. Philosophically, it is interesting that these examples appear to vindicate a position that associates know-how with ability and knowing wh with ability in certain contexts and, furthermore, that KT and KH turn out to be essential markers of occupational competence and that both are necessary in order to ascribe competence.

According to Stanley and Williamson it can be sufficient to attribute KT to someone through performance of an appropriate action. We can now see that this won't do. First, because a single action would be insufficient to attribute know-how in a professional context, however know-how is interpreted. Second, because it is often necessary to seek counterfactual evidence before we can reliably attribute either KH or KT. If candidates are unable to provide an account of why they act and how they would act in hypothetical circumstances, then evidence for their knowledge is inadequate.

This is reflected in qualifications. A candidate for the C&G Diploma in Waste Management has to *describe appropriately the on-site procedures for the management, movement and storage of waste* (p,39). Carrying out these procedures is not sufficient for the attribution of the appropriate KT to the candidate, although necessary for the attribution of the appropriate KH. The assessor needs a comprehensive picture of the candidate's knowledge, more than could be provided by the performance of a few actions.²⁰ The assessor will also want to probe *why* the candidate believes that waste should be handled in a certain manner rather than in another, or will expect a *justification* for these assertions. It is thus misleading, in many professional contexts to attribute KT via the third person route; the ability of the candidate to describe and explain in the first person sense is indispensable to reliable attributions of propositional knowledge and thus to ensuring that candidates understands what they are doing, that is, they know how to act in a variety of complex professional situations. In turn, confidence in the candidate's understanding is vital to the probity of professional curricula and assessment methods.

Professional qualifications are a *guarantee* to society and employers that the person holding the qualification can do what the qualifications says they can do. This is why they are trusted. The stakes are often very high, since an untrustworthy or poorly assessed qualification may put life and limb at peril. The mix of different kinds of knowledge and the way that they are related should actually meet the requirements of a guarantee. The probity of qualifications is tested on an everyday basis. If they pass this test, this gives us some reason to conclude that the underlying epistemological assumptions of the qualification are well-founded. Without an appreciation of the need for genuine (1st person) KT, an integration of KT with KH and an acknowledgement that guidance is needed in interpreting KWh constructions in context, we fail to gain a clear perspective on the design and evaluation of curriculum documents. Neither intellectualism nor anti-intellectualism can provide us with this clear perspective.

Finally, the ambiguous nature of KWh constructions undercuts the intellectualist claim that KH is a form of KWh, since it can be shown that KWh constructions can indicate KH. It is no longer possible to construe the KWh answer to an embedded question reading of knowledge claims as a clear case of KT without begging the question as to what the answer must be. Furthermore, it will not do to assign equivalence to 3rd and 1st person manifestations of knowledge in professional contexts, since the former alone cannot indicate agential understanding of what is being done.

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Notes.

¹ See Kotzee (2016) for an account of the role of explanation in attributions of know-how. Contrary to Kotzee's classification, Winch does not see himself in the 'anti-intellectualist' camp. See conclusion of this article.

² Knowledge terminology in English does not map neatly onto these three and context is often needed to disambiguate propositions about knowledge. This does not mean that there are no differences

between knowing that expressed in KWh constructions and other knowing that claims (See Schaffer 2007).

³ See also White (1982), pp.119-121.

⁴ This rendering occurs through grammatical transformation. For example, 'where B is' in 'A knows where B is' is an answer to the (unasked) question 'Where is B?' But a) where is B? is not actually asked; b) the 'answer' in 'where B is' transposes the 'is' within the complement and c) a force marker '?' is added to form the question. Some commentators suggest that KWh constructions are better seen as attaching a complement to the *knows* claim, thus 'where B is' is attached to 'A knows...' (see Parent, (2014) pp. 87-88 for more on this).

⁵ We need to take account of the tacit element in know-how and accept that no account can be complete. See Gascoigne and Thornton (2013) for a claim to the articulability of tacit knowledge and Winch (2016) for a critique. See Krogh, G, Ichijo, K. and Nonaka, I. for the claim that tacit knowledge can be shared.

⁶ Kotzee maintains that know how always involves being able to give an account (p.231). The claim argument here does not support this claim in the general sense but does do so for a variety of forms of professional assessment That Tom can explain how a light socket should be installed increases our confidence in his knowing how to do so..

⁷ There could be a lesser form of KT, expressible only in 3rd person terms, but this makes the full 'KH/KWh is KT' claim without qualification, problematic. See more on this in the concluding discussion.

⁸ There are no claims here about whether justification plus true belief constitutes a sufficient condition for knowledge.

⁹ Contrast White op.cit. who seems to think that 1st and 3rd person attributions are equally expressive of knowledge. For White, possessing knowledge is possessing an ability to answer a question. But this kind of ability must be a form of know-how.

¹⁰ Note that *t* can designate a particular time or can describe a time at which A knows when to terminate the group work, for example when following a rigidly prescribed lesson plan. A may not recognise that *t* is that time and thus fail to terminate the group work. This does not make sense when *t* designates a specific time, although we should also allow for the possibility that A recognises *t* and that *t* is a time to terminate the group work, but A does not know how to terminate the group work at *t*.

¹¹ As we shall see, we will need a construction like 13] to take account of cases where Knowing Wh involves judgement. This is not necessarily the case with 12], where the response could be automatic. See the discussion in Wiggins (2012) pp.107-8 and pp. 113-4. Wiggins' own example concerns the work of librarians know which kind of catalogue to access.

¹² Malcolm's example shows us that it is legitimate to infer KT from an appropriate action in the right circumstances, not that all such cases are equivalent to 1st person manifestations of KT. This point is also important for the *knowing to* cases which involve judgement.

¹³ For a contrasting view of what plumbers need to know see Carr (1981), p.61.

¹⁴ The philosophical literature on know-how and expertise show different views on this issue, ranging from Dreyfus' (1996) characterization of expertise as a form of unconscious fluency, to Lum's (2013) advocacy of expansive assessment, treating all forms of knowledge as aspects of the same phenomenon, to the views of Eraut (1994) and Winch (2010) which emphasise the role that systematic knowledge plays in professional action.

¹⁵ Not all forms of ability involving recognition are instances of know-how, but this complex is, as it involves correct recognition of a curve in the track, intention to drive the train safely, a rationale for acting and is subject to evaluation (how prompt, how accurate, how detailed was the recognition?). Although we do not normally say A knows how to judge that *p*, the ability to judge that *p* in this case has the characteristics of know how.

¹⁶ Malcolm's example seems to contradict this, but Malcolm is not claiming that two of the sons are incapable of saying where daddy left the shovel, only that they need not, on this occasion, do so.

¹⁷ We should distinguish this from the case where *A knows that p is a place to apply the instrument correctly*, which would mean where it is appropriate to apply it. Here 'correctly' qualifies the place rather than the knowledge.

¹⁸ This seems to be less the case than previously in English qualification documents, for example in the C&G qualifications reviewed. For a document with more curriculum content, see BTEC 2003).

¹⁹ Surprisingly, both Ryle and Stanley and Williamson seem to think that 3rd person demonstrations of knowledge that *p* are equivalent in probative force to 1st person articulation. This is not generally the view of exam boards.

²⁰ See the critique of Competence Based Training and Education initiated by Hyland (1993).