
Title: Acta Analytica.
ArticleTitle: Rescuing the Assertability of Measurement Reports
ArticleAuthor: Michael Shaffer
Date: 2018

Acta Anal
https://doi.org/10.1007/s12136-018-0359-2

Rescuing the Assertability of Measurement Reports

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Received: 1 April 2018 / Accepted: 18 June 2018

Abstract It is wholly uncontroversial that measurements or, more properly, propositions that are measurement reports are often paradigmatically good cases of propositions that serve the function of evidence. In normal cases, it is also obvious that stating such a report is an utterly pedestrian case of successful assertion. So, for example, there is nothing controversial about the claims that (1) a proposition to the effect that a particular thermometer reads 104 °C when properly used to determine the temperature of a particular patient is evidence that the patient in question has a fever and (2) there is nothing wrong with asserting the proposition that a particular thermometer reads 104 °C for appropriate reasons of communication, etc. when the thermometer has been properly used to determine the temperature of a particular patient. Here, it will be shown that Timothy Williamson's commitments to a number of principles about knowledge and assertion imply that a whole class of utterly ordinary statements like these that are used as evidence are not really evidence because they are not knowledge and so are (perversely) unassertable according to his principled commitments. This paper deals primarily with the second of these two problems, and an alternative account of the norms of assertion is introduced which allows for the assertability of such measurement reports.

1 Introduction

It is wholly uncontroversial that measurements—or, more properly, *propositions* that are measurement reports—are often paradigmatically good cases of propositions that serve the function of evidence. In normal cases, it is also obvious that stating such a report is an utterly pedestrian case of successful assertion. So, for example, there is nothing controversial about the following claims: (1) that a proposition to the effect that a particular thermometer reads 104 °C when properly used to determine the temperature of a particular patient is evidence that the patient in question has a fever and (2) that

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Published online: 28 June 2018

there is nothing wrong with asserting the proposition that a particular thermometer reads 104 °C for appropriate reasons of communication, etc. when the thermometer has been properly used to determine the temperature of a particular patient. Here, it will be shown that Timothy Williamson's commitments to a number of principles about knowledge and assertion imply that a whole class of utterly ordinary statements like these that are used as evidence are not really evidence because they are not knowledge and so are (perversely) unassertable according to his principled commitments. This paper deals primarily with the second of these two problems, and an alternative account of the norms of assertion is introduced which allows for the assertability of such measurement reports.[1]

2 The Commonality Thesis

Recently, there has been much interest in the topic of the norm(s) of assertion and this interest drives from a variety of sources. The debate concerning pragmatic encroachment on knowledge is one such source, and the debate about whether or not pragmatic factors affect whether an agent knows or does not know involves the issue of the proper norm for practical reasoning or acting. Those who endorse pragmatic encroachment on knowledge have typically defended the view that the proper norm of practical reasoning is knowledge. In other words, they defend the knowledge norm for practical reason. This in turn suggests that the proper norm for *assertion* is knowledge via what is known as the commonality thesis. The commonality thesis is just the idea that the proper norm of assertion is the same as the proper norm of practical reasoning.[2] Timothy Williamson in particular has defended the commonality thesis.[3] So, for Williamson, the proper norm of both practical reasoning and assertion is knowledge, and, in its most elemental form, this principle is the following claim:

(KN-C) one should act on or assert a proposition only if it is known.

This is composed of the following two sub-principles:

(KN-PR) one should act on a proposition only if it is known, and
(KN-A) one should assert a proposition only if it is known.

Both the knowledge norm of assertion and the knowledge norm of practical reasoning have been subjected to considerable criticism, even though they have also been vigorously defended by some influential contemporary philosophers.[4] Williamson in particular defends the knowledge norm for assertion by appeal to its supposed

[1] A solution to the first problem is presented in Shaffer (2015). It should also be noted here that no consideration will be given here to alternate views of assertion extant in the literature. The purpose of this paper is solely to engage with Williamson's views and to advance an alternative consonant with the view of assertion presented in Shaffer (2012a) and in Shaffer (2012b).
[2] See Brown (2011).
[3] Williamson (2000).
[4] See, for example, Hawthorne (2004), Hawthorne Stanley (2008), Williamson (2000), and Williamson (2005).

explanatory power. More specifically, he argues that the knowledge norm of assertion is the best explanation of the unassertability of sentences of the form "p, but I do not believe that p." In mounting this defense, Williamson claims that such Moorean sentences are (1) unassertable and (2) that the best explanation of this fact is that knowledge is the proper norm of assertion. Of course, Williamson notoriously has much to say about the nature of knowledge itself as well.

3 Williamsonian Epistemology

The core thesis of Williamson's (2000) radical knowledge-first epistemology is the claim that one's evidence is equivalent to what one knows. This thesis is widely known as the "E = K" thesis. Where "$K_S p$" signifies that S knows that p and "$E_S p$" signify that p is evidence for S, this thesis can be regimented as follows:

$$\text{(W1)}\ E_S p \equiv K_S p.$$

Moreover, according to Williamson, knowledge is the most general factive mental state operator. This is just to say that if a proposition is known, then it is true. This is just the familiar and orthodox factivity condition for knowledge. It can be simply stated as follows:

$$\text{(W2)}\ K_S p \rightarrow p.$$

W1 and W2 entail is the following very interesting claim:

$$\text{(W3)}\ E_S p \rightarrow p.$$

W3 is a *factivity condition for evidence*. In addition, Williamson (2000) is also committed to *the safety condition* for knowledge. The safety condition can be understood simply as follows: If S knows that p, then S could not easily have falsely believed that p. Safety can be made more precise as follows:

$$\text{(W4)}\ (w_i \vDash K_s p) \rightarrow \neg[< w_i > \vDash (B_s p \& \neg p)].$$

Here, "w_i" is world i, "$K_s p$" represents that S knows that p, "$<w_i>$" is the set of worlds sufficiently close to w_i, and "$B_s p$" represents that S believes that p. So understood, W4 is the claim that if S knows that p at w_i, then in worlds sufficiently similar to w_i (including w_i), S does not believe that p when p is false. This regimentation of the safety condition captures the core idea of that condition well.

In virtue of Williamson's explicit commitment to W1 as the core of his knowledge-first epistemology and his commitment W4, he is also committed to the following principled claim about evidence:

If p is evidence for S, then S could not easily have falsely believed that p.

This derived principle will turn out to be crucial for one horn of the dilemma involved in the argument that follows. Formally, it can be regimented as follows:

$$\text{(W5)}\ (w_i \vDash E_s p) \rightarrow \neg[< w_i > \vDash (B_s p \& \neg p)],$$

Let us then turn to the crux of the issue to be raised here.

4 Measurement Reports, Evidence, and Assertability.

The problem to be raised here for Williamson is that many cases involving the use of propositions that are the reports of measurements as evidence appear to be paradigmatic cases of good evidence, but they cannot be evidence at all according to his various commitments and they turn out also to be perversely unassertable. But, this conclusion is wildly implausible and so, as we shall see, we can build a reductio of his views. First, we can straightforwardly agree that measurement and the reports of such measurements are inexact. In order to account for this inexactness, we must either treat such propositions as false but approximately true or treat as true in some qualified manner. This is the key dilemma in the argument to be made here. On the one hand, if such measurement reports are false but approximately true, then by W3, they cannot be evidence. By W1, they are not knowledge, and by KN-A, they are either defective assertions or not assertions at all. On the other hand, if measurement reports are qualified but true, then there will always be close possible worlds where the proposition that is the report of a measurement will be false but still believed. In virtue of W5, all such propositions will not be evidence and are not knowledge. By KN-A, they are then either defective assertions or not assertions at all. So, not matter how we regiment and understand measurement reports, they are either defective assertions or not assertions at all given Williamson's views on knowledge and assertion. In other words, all such propositions are not evidence and are *unassertable*. But this is simply absurd and so we have a reductio. In order to flesh out this argument, let us look a bit more closely at the both horns of this dilemma.

5 False But Approximately True

Let us address the first horn of the dilemma raised here via the consideration of two illustrative examples, and let us be clear that according to this interpretation of the inexactness of measurements, they are false but approximately true. Millikan's famous oil drop experiments were conducted in order to empirically determine the charge on an electron, e, and to determine that electrical charge was quantized in discreet units rather than continuous.[5] Let us then consider the manner in which this experiment was performed in the effort to confirm the claim that electrical charge is quantized. To begin, the value of e is theoretically determined as follows. Where N_A is Avogadro's constant and F is Faraday's constant, the value of e is given by the equation $e = F/N_A$. But, Millikan's experimental procedure to empirically determine the value of e was quite complex and involved spraying small electrically charged drops of oil in an electric field produced in an ingenious apparatus. This apparatus involved a parallel pair of horizontal metal plates across which a uniform electrical filed was created. Oil drops were allowed to fall and then rise due to the effect of the electrical field produced in Millikan's apparatus. These droplets move at a rate determined by gravity, the

[5] See Franklin (1997), Shaffer (2013), and Shaffer (2015).

viscosity of the air, and the electric force involved. The gravitational and viscous forces on the oil drops are calculated based on the size and velocity of the oil drops. As a result, the electric force on the oil drops can thereby be determined. Since this electric force is the product of the electric charge and the electric field involved, the electric charge of the oil drops can also be determined. By measuring the electrical charges of many oil drops, Millikan was able to determine both the value of e, and that the charges are all integer multiples of e (i.e., that they are quantized). Determining a relatively exact value of e involved measuring the following parameters involved in the experiments using his apparatus as accurately as possible: temperature, pressure, voltage, the coefficient of viscosity of air, the density of clock oil, the value of the gravitational constant, and the times of rise and fall of the oil drops.

The important point to note here is that all of Millikan's measurements were—and still do—constitute evidence for the claim that electrical charge is quantized. But, the measured quantities used to indirectly determine the value of e *are all approximations*. This is due to the measurement errors inherent in determining the values of the relevant parameters in the experiment. More accurate and contemporary experimental methods have determined that the value of e is $1.602176487(40) \times 10^{-19}$ C. But, Millikan's experiment determined the value of e to be $1.5924(17) \times 10^{-19}$ C on the basis of sets of measurements generated by a significant number of experimental runs. So, the evidence that confirms the claim that electric charge is quantized is only approximately true, and this is due to the inexactness of the various methods of measurement used in the oil-drop experiment. So, it would appear to be the case that some propositions can be evidence even though they are only approximately true. This further entails both that false propositions can constitute evidence because all approximately true propositions are false.

A more mundane example of this aspect of evidential practice and its methodological significance can be seen in the following admittedly hypothetical but perfectly ordinary case. Suppose that Jane is attempting to move his couch into her new apartment. So, let us suppose that she measures the width of the couch and the width of the entry door to her apartment using a standard tape measure. Suppose that she determines via this method that the door is 3.5 ft wide and that the couch is 4.5 ft wide.[6] On this basis, she might reasonably conclude that the couch will not fit through the doorway. Suppose also however that, due to the inexactness of Jane's measurements, the door is not exactly 3.5 ft wide. Suppose that it is really 3.51246 ft wide. Suppose also that the couch is not exactly 4.5 ft wide and that it is really 4.489 ft wide. As in our scientific case, it should be clear that these figures are false but approximately true. As in the case of Millikan's oil drop experiment, those pieces of evidence are, nevertheless, still very good evidence for the claim that the couch will not fit through the doorway. So, as in the case of Millikan's experiment, it would appear to be the case that some propositions can be evidence even though they are only approximately true. Again, this further entails that false propositions can constitute evidence and this is because all approximately true propositions are false.

[6] Let us also assume that this dimension of the couch is such that the couch cannot be manipulated so as to reduce the width of the couch relative to the width of the door. So, for example, it cannot be tilted to fit it through the door.

However, in both cases Williamson is committed to the view the relevant propositions being used as evidence are not really evidence and that they are not even assertable. Given Williamson's principled commitments, the measurement report that the value of e is $1.5924(17) \times 10^{-19}$ C in the Millikan case is not evidence for the quantization of charge because this is only approximately true and this measurement report is not assertable because it is not known. This is the case because the measurement report involved is only approximately true and all approximately true propositions are false. So, by W3, this report is not evidence, by W1, it is not knowledge, and by KN-A, any putative assertion to this effect is either a defective assertion or not an assertion at all. The same thing goes for the Jane case. Her measurements used to determine that the door is 3.5 ft wide and that the couch is 4.5 ft wide that are employed as putative evidence for the claim that that the couch will not fit through the doorway are false but approximately true. By W3, these measurement reports are not evidence, by W1, they are not knowledge, and by KN-A, any putative assertions of these propositions are either defective assertions or not assertions at all. But, of course, these conclusions are absurd.

6 True But Unsafe

Let us then turn to the other horn of the dilemma whereby the inexactness of measurement is treated in terms of qualified truths. As we shall see, most propositions that are the reports of measurement results are demonstrably unsafe so understood. They are demonstrably unsafe because the justifiably believed measurement results could almost always easily be false. So, they cannot constitute knowledge for Williamson. Moreover, if W3 is true, then they are not actually evidence at all, and by KN-A, the propositions that constitute measurement reports so understood are not even assertable. But, this is absurdly skeptical stance to take with respect to the evidentiary role of measurements in the sciences and more mundane epistemic pursuits. Such a view simply does not reflect real epistemic practice. In such practice, we often treat measurements as exceptionally good evidence and there is nothing wrong with assertions of measurement results.

The problem with W5 is that for all (real) inexact measurement procedures, the reports that serve as evidence could almost always easily have been falsely believed. This can be easily established on the basis of the following considerations. Consider measured values x_i obtained on the basis of measurement procedure M for measurable variable x. Let us suppose also that x_1 is a bit of evidence for some theoretical claim T. So, in w_1, M yields value for x of x_1. For *any* such case, there will be many very close worlds that are nomically indistinguishable from w_1, $<w_1>$, where the agent making the measurement, S, believes falsely that the value of x is x_1. In these very close worlds, there exist no more precise measurement procedures with respect to x (so they are relevantly nomically similar to w_1 in that specific respect) than exist in w_1, but the real values of x in those worlds will vary infinitesimally from what M tells us the value of x is at w_1, e.g., say the value of x at some member of $<w_1>$ is really x_2 such that $x_2 = x_1 +$ .000000000000000000000000000000000000000000000001. This response is fully generalizable for any case of measurement, and by our construction, there will be no nomically possible way to detect such possible but tiny errors. So, S could almost always easily have had a false belief about virtually any measurement report, and W5 will almost always be violated in cases where measurements serve as evidence.

One might respond to this criticism by claiming that measurement evidence really involves propositions of the form "$x \pm \delta$." But, this does not save the view. Once again, consider measured values x_i obtained on the basis of measurement procedure M for measurable variable x. Let us suppose also that x_1 is a bit of evidence for some theoretical claim T and that due to the nomic features of the world w_1 in which M is being employed, M has a determined margin of error of $\pm\ \delta$. So, in w_1, M yields value for x of $x_1 \pm \delta$. For any such case, there will be many very close worlds that are nomically indistinguishable from w_1, $<w_1>$, where the agent making the measurement, S, believes falsely that the value of x is $x_1 \pm \delta$. In these very close worlds, there exist no more precise measurement procedures with respect to x (so they are again relevantly nomically similar to w_1) than exist in w_1, but the real values of x in those worlds will vary infinitesimally from what M tells us the value of x is at w_1, e.g., say the value of x at some member of $<w_1>$ is really $x_2 \pm \delta$ such that $x_2 = x_1 +$ .0000000000000000000000000000000000000000000000000000001. Here, we have to be careful about interpreting these sorts of cases so as to be clear about the crux of the problem here. The problem involves having the following very specific belief in w_1, $B_S(v(x) = x_1 \pm \delta)$, while also, at some member of $<w_1>$, $B_S(v(x) = x_1 \pm \delta)$ even though it is false because $v(x) = x_2 \pm \delta$ at that world. Of course, there will be arbitrarily many such worlds corresponding to various miniscule deviations in the value of x from x_1. It is crucial to see that in this construction, there is an important variation in the value of x *and* its associated uncertainty taken as a whole and these cases are not merely cases where at w_1 $B_S(v(x) = x_1 \pm \delta)$ and the value of x at some member of $<w_1>$ is x_2.[7] For if that was all that such cases involved, S's belief would be true at the posited member of $<w_1>$ if $x_2 - x_1 > \delta$ and we would not have a clear violation of safety. But, according to safety, S does not know that $v(x) = x_1 \pm \delta$ and it cannot be evidence for S when we see that the case involves $B_S(v(x) = x_1 \pm \delta)$ at w_1 while both $B_S(v(x) = x_1 \pm \delta)$ and $v(x) = x_2 \pm \delta$ are true at some member of $<w_1>$. Again, this response is fully generalizable for any case of measurement, and in our construction, there will be no nomically possible way to detect such possible errors. So, S could almost always easily have had a false belief about virtually any measurement report and W5 will almost always be violated in cases where measurements serve as evidence.

A second response one might make to this criticism also involves claiming that measurement evidence takes the form of propositions of the form "$x \pm \delta$." Given this line of thinking, one might suggest that worlds where the value of x cannot be discriminated from worlds where the value of x is infinitesimally different are all included in the range of x. Consequently, the propositions that report measurements and serve as evidence in scientific practice are in fact true. However, this maneuver does not work to block the safety version of the argument form approximation because we can simply shift the locus of the criticism just introduced to δ itself. Once more, consider measured values x_i obtained on the basis of measurement procedure M for measurable variable x. Let us suppose also that x_1 is a specific bit of evidence for some theoretical claim T and that due to the nomic features of the world w_1 in which M is being employed, M has a determined margin of error of $\pm\ \delta$. So, in w_1, M yields a range of values for x, specifically $x_1 \pm \delta$. As in our previous cases, for any such case, there

[7] This effectively deals with the sort of predictable response Williamson might make to this case along the lines suggested in Williamson 2011.

will be many very close worlds that are nomically indistinguishable from w_1, $<w_1>$, where the agent making the measurement, S, believes falsely that the value of x is $x_1 \pm \delta$. In these very close worlds, there exist no more precise measurement procedures with respect to x than exist in w_1, but the real values of $x \pm \delta$ in those worlds will vary infinitesimally from what M tells us the range of values x has at w_1, e.g., say the range of values of x at some member of $<w_1>$ is really $x_1 + \delta'$ where $\delta' = \delta + .000000000000000000000000000000000000000000000000000000001$. Once again, this response is fully generalizable for any non-ideal case of measurement, there will be no nomically possible way to detect such possible but tiny errors in the range of values determined for x at that world. So, again, S could almost always easily have had a false belief about virtually any measurement report, and W5 will almost always be violated in cases where measurements serve as evidence. So, this second response also fails to block the criticism raised here.

The result then is robust, and the main contention made here is that Williamson views imply a totally implausible views of measurement evidence and of the assertability of evidence reports, provided one grants the probity of the use of measurement evidence as it is used in scientific practice whether we treat measurement reports as approximate truths or as qualified truths. It follows then that one or more of the principles he endorses that were noted above is false and that we ultimately need to examine some related principles that might be appealed to in order to avoid this implausible result. Let us begin by looking a bit more closely at KN-A and Williamson's argument for that principle. This is important because if KN-A can be replaced with an account of the norm of assertion that renders measurement reports assertable, then we do not really need to identify the specific epistemic principle(s) that should be rejected in order to rescue the assertability of such claims. It may very well be true that one or more of Williamson's epistemic commitments needs to go, but as things stand here, we can avoid confronting that problem here.

7 Rejecting KN-A: Rescuing the Assertability of Measurement Reports

Why is the alleged unassertability of Moorean sentences supposed to support the knowledge norm of assertion? This is supposed to be the case because if asserting that p is governed by the norm of knowledge, then one should assert p, if and only if, it is true. If one also accepts the view that knowledge entails belief one should assert that p, if and only if, p is believed. This entails that to assert a Moorean sentence is to violate the knowledge norm of assertion and one ought not to assert that p when p is not believed. This is because in such a case, it cannot be known. Consider the claim that Obama is the President of the USA in 2012 and Howard's attempt to assert the following compound proposition:

(O) Obama is the President of the USA in 2012, but I do not believe it.[8]

To this end, let us suppose that Howard utters the English sentence "Obama is the President of the United States in 2012, but I do not believe it." What Howard is saying

[8] This case was first introduced in Shaffer (2012b).

is widely supposed to be paradoxically odd—as originally noticed by Moore. Williamson alleges that this is the case because Howard is violating the knowledge norm of assertion. Asserting O involves the assertion of a compound proposition composed of two component propositions:

(OP1) Obama is the President of the USA in 2012.
(OP2) I do not believe that Obama is the President of the USA in 2012.

In attempting to assert O, Howard's assertion of OP2 conflicts with his assertion that OP1. Given this view if O is properly asserted, then both OP1 and OP2 are known. However, knowing OP1 implies the negation of OP2. So, according to Williamson's view, Howard is *failing to make a real assertion*. What he is saying does not meet the standard for assertion because that standard is knowledge. So, according to Williamson, such Moorean sentences are unassertable. This purported fact is supposed to be explained by the knowledge norm of assertion.

There are a variety of criticisms that have been leveled against the knowledge norm of practical reasoning. If the commonality thesis is true, then such criticisms implicate the knowledge norm of assertion too. The most convincing of these criticisms concern the claim that knowledge is necessary for action and these criticisms have then given rise to a whole host of weaker suggestions concerning the proper norm for action. Recently, the following alternative has been proposed account of the norm of practical reasoning has been proposed. Where the choice is p-dependent,

(JBAT-PR) it is epistemically rational for S to employ p (appropriately) in S's practical reasoning only if:

(i-PR) it is at least the case that S is justified in believing that p is approximately true, and
(ii-PR) p is at least approximately true.[9]

This weaker view was proposed in light of counterexamples that implicate both the knowledge norm and its other weaker cousins, such as those proposed by Neta and Littlejohn.[10] It is important to notice that the justified belief component of the left hand side of the bi-conditional of JBAT-PR is qualified by an "at least" qualification with its scope outside the doxastic operator. This is intentionally designed to capture the idea that the norm of practical reasoning involves at least S being justified in her belief that p is approximately true. This is then compatible with S's being justified in her belief that p is strictly true as well as her being justified in her belief that p is only approximately true. We cannot just substitute S is justified in believing that p is at least approximately true for S is justified in believing that p is true or S is justified in believing that p is approximately true without running into problems as demonstrated in Shaffer 2012a, b, c. So that particular qualification is crucial. In the other conjunct in the left hand side of the bi-conditional p's being at least approximately true means that p is true *or* that p is approximately true.

[9] Shaffer (2012a).
[10] See Neta (2009) and Littlejohn (2009).

This weaker principle captures a much more reasonable sense of the epistemic conditions on practical reasoning, and it has two important virtues. First, it gets us the correct result in a wide variety of allegedly problematic cases. Second, this weak principle of the epistemic conditions on practical reasoning respects what a number of variously motivated philosophers have convincingly argued about epistemic rationality and inexact truth to a much greater extent than do any of the other proposals. This is interesting because the parties involved in the debate about the knowledge norm of practical reasoning have by and large simply assumed some implicit philosophical or folk theory of rationality that ignores the practical rationality of inexact, partial, or approximate truths. But, recently and compellingly, some more perspicacious thinkers have argued that rational thinking and acting involve the use of approximations, idealizations, and/or inexact truths.[11] We are less than perfectly rational, and the debates between the various defenders of the heuristic and bias tradition, the ecological rationality model, and more traditional views attest to this.[12]

The details of these debates are not important here, but what they strongly suggest collectively is that we sometimes base both practical and theoretical reasoning on propositions that are not exactly true and that we can be efficient problem solvers and deliberators even though we do not reason in maximally accurate ways on the basis of strict truths.[13] We often trade degrees of accuracy with respect to truth for things like efficiency, ease of use, and generality without compromising rationality or success. Given this perspective, it is not always irrational to employ approximate, partial, or inexact truths in our practical reasoning. JBAT-PR reflects this whereas the stronger alternatives alluded to above cannot accommodate this possibility. So JBAT-PR is more realistic on this count, and what is interesting for the issue at hand is that if some weaker analog of the commonality thesis is true and JBAT-PR is the proper norm for acting, then JBAT-A is the proper norm for asserting. This can be understood as follows:

(JBAT-A) It is epistemically rational for S to assert p only if:

(i-A) it is at least the case that S is justified in believing that p is approximately true, and
(ii-A) p is at least approximately true.

It is crucial to note then that if JBAT-A is the proper norm for assertion, Moorean sentences can be assertable. As a result, Williamson's defense of the knowledge norm of assertion on the basis that it best explains the unassertability of Moorean sentences is a failure.

The following sort of case demonstrates that there are, in fact, assertable Moorean sentences:

MATH1: Joe is an elementary school mathematics teacher and he is teaching his students about geometry. In the course of teaching his students how to calculate

[11] See, for example, Elgin (1996), Cartwright (1983), Millgram (2009), Wilson (2006), and Wimsatt (2007).
[12] See, for example, Elio (2002), Piattei-Palmarini (1994), Gerd Gigerenzer (2000), Shaffer (2009), and Shaffer (2012c).
[13] See Shaffer (2009).

the area of a circle via the use of the equation A = πr^2 he tells his students the value of π. Specifically, he says that $\pi = 3.14159$. Joe works out several examples and the students learn how to do this for themselves.

MATH1 is an utterly pedestrian and realistic case, and in MATH1, Joe asserts that $\pi = 3.14159$ via his uttering the English sentence "the value of pi is 3.14159." Strictly speaking, this is false. However, it is close enough to the truth for the purposes of Joe and his students. According to defenders of the knowledge norm of assertion, Joe is violating the proper norm of assertion. So, he is either acting inappropriately or failing to make an assertion. Of course, neither of these options is at all plausible. Joe is asserting a proposition in a perfectly ordinary sense and his assertion seems entirely appropriate in the context described. He is making an assertion that involves a not exactly true proposition, and this seems entirely reasonable. So, there is clearly something wrong with the knowledge norm of assertion. But, it is not a case where one can reasonably bite the bullet and claim that Joe's behavior is epistemically irrational, as might be the case if he were baldly asserting a falsehood that was not approximately true. So, it seems to be the case that it can be epistemically rational to assert some falsehoods. Consider the following slight modification of MATH1:

MATH2: Joe is an elementary school mathematics teacher and he is teaching his students about geometry. In the course of teaching his students how to calculate the area of a circle via the use of the equation A = πr^2 he tells his students the value of π. Specifically, he says that $\pi = 3.14159$. Joe works out several examples and the students learn how to do this for themselves. After class he winks at his best student Jane, who is aware that his assertion bout the value of pi is only an approximation, and says "the value of pi is 3.14159, but I don't believe it."

The Moorean sentence uttered in MATH2 has the supposed air of paradox about it that many have attributed to Moorean sentences, but this is only a prima facie problem given JBAT-A.[14] If it is epistemically appropriate to assert approximately true propositions that one is at least justified in believing to be approximately true, then there is nothing wrong with Joe's assertion in MATH2. We can work this out in more detail as follows. In MATH2, Joe is attempting to assert this compound proposition:

(C) The value of pi is 3.14159, but I do not believe it.

Asserting C involves the assertion of a compound proposition constituted by these propositions:

(CP1) The value of pi is 3.14159.
(CP2) I do not believe that the value of pi is 3.14159.

[14] One might be tempted to claim that the prima facie assertability of the cases appealed to here has something to do with contextual factors and that this does not apply in ordinary, more mundane, contexts. This is an interesting view that is worth exploring further, but all that is necessary for the point of this paper is that the assertability of claims like measurement reports in the context of the sciences is plausible.

In attempting to assert C, Joe's asserting CP1 might initially appear to conflict with his assertion of CP2, but this conflict vanishes when the assertion is understood in terms of JBAT-A. If C is properly asserted and JBAT-A is true, there is nothing wrong with Joe's assertion. Both CP1 and CP2 are at least approximately true, and it is at least the case that Joe is justified in believing that they are approximately true. CP1 is approximately true and Joe is justified in believing that it is approximately true. CP2 is true and he is justified in believing that it is true. He does not really believe that the value of pi is, *strictly speaking*, 3.14159. So, the context of the assertion of CP1 in MATH2 renders that assertion epistemically rational, despite its being an approximation, and this is fully compatible with the simultaneous epistemically rational assertion of CP2. In virtue of JBAT-A, Joe is making a real and fully coherent assertion of C, despite its superficial paradoxical character. As a result, neither Williamson's claim that Moorean sentences are unassertable nor his claim that the unassertability of Moorean sentences is (best) explained by the knowledge norm of assertion is compelling. It is simply false that all Moorean sentences are unassertable and the knowledge norm *cannot* be the best explanation of the unassertability of such sentences.

What is of greatest importance here is that JBAT-A can be used to rescue the assertability of measurement reports both if they are false but approximately true and if they are true but qualified. So, while the dilemma introduced earlier shows that there is something wrong with Williamson's epistemic commitments qua the evidential role of measurement reports and that one or more of the epistemic principle he endorses should be rejected, we do not have to decide what precisely to so about this issue in order to rescue the assertability of measurement reports.[15] All that we need to do to accomplish this aim is to reject KN-A and replace it with JBAT-A. This is reasonable because a principled argument in favor of JBAT-A has been provided here. So all that remains to be done is to show how JBAT-A implies the assertability of measurement reports like those discussed above. It turns out that this is the case both where such reports are interpreted as false but approximately true and where they are interpreted as true but qualified.

First, according to JBAT-A, false but approximately true propositions that are justifiably believed to be approximately true are thus assertable because they are at least approximately true. So, there is no problem with the assertability of measurement reports like the claim that the value of e is $1.5924(17) \times 10^{-19}$ C in the Millikan case if we interpret such a claim as false but approximately true. That the value of e is $1.5924(17) \times 10^{-19}$ C is at least approximately true and it is justifiably believed to be so in the case described. The same thing goes for the Jane case. On this interpretation of measurement reports, the reports that the door is 3.5 ft wide and that the couch is 4.5 ft wide that are employed as putative evidence for the claim that that the couch will not fit through the doorway are false but approximately true. Thus, they are at least approximately true and they are justifiably believed to be approximately true. So, according to JBAT-A, they are assertable. Of course, there will then be very many similar cases of perfectly normal measurement reports that are assertable in the same way and for the same reasons.

Second, according to JBAT-A, true qualified propositions (even if they are unsafe) that are justifiably believed to be at least approximately true will also be assertable

[15] Again, this issue is treated in Shaffer (2015).

because they are at least approximately true. So, there is no problem with the assertability of measurement reports like the claim that the value of e is 1.5924(17) × 10^{-19} C in the Millikan case if we interpret such a claim as a qualified truth. That the value of e is 1.5924(17) × 10^{-19} C is then at least approximately true and it is justifiably believed to be so in the case described. Again, the same thing goes for the Jane case. On this interpretation of the measurement reports, the reports that the door is 3.5 ft wide and that the couch is 4.5 ft wide that are employed as putative evidence for the claim that that the couch will not fit through the doorway are qualified truths that are unsafe. Thus, they are then at least approximately true and they are justifiably believed to be approximately true in this case. So, according to JBAT-A, they are assertable and there will be very many similar cases of perfectly normal measurement reports that are assertable in the same way and for the same reasons. So, whatever we say about the locus of the problem of measurement reports in terms of Williamson's epistemic commitments and their function as evidence, we can avoid the problem of their putative unassertability by replacing KN-A with JBAT-A, and there are compelling independent reasons that favor JBAT-A over KN-A in any case.

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