Development and validation of the Student Attitudes and Beliefs about Authorship Scale (SABAS): A psychometrically robust measure of authorial identity

K.Y.F. Cheung[a]*, E.J.N. Stupple[b], and J. Elander[b]

[a]*Cambridge English Language Assessment, University of Cambridge, Cambridge, UK;*
[b]*Centre for Psychological Research, University of Derby, Derby, UK*

*Corresponding author. Email: cheung.k@cambridgeenglish.org

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Development and validation of the Student Attitudes and Beliefs about Authorship Scale (SABAS): A psychometrically robust measure of authorial identity

One approach to plagiarism prevention focuses on improving students' authorial identity, but work in this area depends on robust measures. This paper presents the development of a psychometrically robust measure of authorial identity - the Student Attitudes and Beliefs about Authorship Scale. In the item generation phase, a pool of items was developed and assessed for content validity by subject matter experts. In the exploratory phase, data from 439 higher education students were used to identify a latent variable model with three factors: 'authorial confidence', 'valuing writing' and 'identification with author'. In the confirmatory phase, data from 306 higher education students were used to test the three-factor model's reliability and validity. The three-factor structure was confirmed, and the results showed the SABAS has a stronger psychometric basis than previously available measures. This measure of authorial identity can be used with confidence in research and pedagogy to help students improve their authorial identity.

Keywords: plagiarism; authorial identity; academic writing; psychometrics; pedagogy

Introduction

One approach to reducing unintentional plagiarism is to improve students' authorial identity, so that they understand the role of the author better, and take a more authorial role in the production of their university assignments. This approach has been adopted in psychology (Elander et al. 2010; Kinder and Elander 2012), accounting (Ballantine and Larres, 2012; Ballantine, Guo, and Larres 2013) and health (Maguire, Reynolds, and Delahunt, 2013). All of those studies used the only available questionnaire measure of authorial identity, the Student Authorship Questionnaire (SAQ) (Pittam et al. 2009). This 18-item questionnaire has three scales measuring attitudes to authorship ('confidence in writing', 'understanding authorship', and 'knowledge to avoid

plagiarism') and three measuring approaches to writing ('top-down', 'bottom-up' and 'pragmatic').

However, the SAQ has substantial psychometric limitations. First, its content validity is questionable, because the items were not systematically generated. Furthermore, the approaches to writing scales are not part of the core authorial identity construct, whereas other important aspects of authorial identity may have been omitted. Second, the six-factor structure may not be valid, for the Eigenvalue-over-one rule that was used to extract factors has been heavily criticised by measurement theorists (e.g., Zwick and Velicer 1986; Hayton, Allen, and Scarpello 2004; Velicer, Eaton, and Fava 2000). There were also multiple cross-loadings (i.e., items that loaded strongly onto more than one factor in the model), and items were only interpreted according to their highest loading, when in one case the difference between loadings was only .03 (Pittam et al., 2009). Third, internal consistency was poor, with Cronbach's (1951) alphas for three scales ranging from poor to moderate, and three other scales with only two items each where Cronbach's alpha was not reported.

There is therefore a need for a measure with more homogeneous items and good content validity, plus a confirmed factor structure and good internal consistency. One analysis identified a three-factor model based on 12 of the 18 original SAQ items, which had substantially better psychometrics than the original SAQ (Ballantine, Guo, and Larres, 2013). However, that approach does not address the problems relating to the SAQ's item generation and content validity, as it used the same set of original items proposed by Pittam et al. (2009).

The current research therefore aimed to develop and evaluate a new measure of authorial identity, following established good practice for psychometric scale development and evaluation (e.g., DeVellis 2012). This began with a systematic process

of generating a large item pool, assessing the content validity of those items, and discarding items with low content validity. A reduced pool of items with good content validity was then administered to a large sample of university students and subjected to exploratory factor analysis (EFA) to identify a latent variable model. The number of items was further reduced through an iterative process applying Cronbach's alphas, item-total correlations, principal axis factoring (PAF) and parallel analysis (PA). The resulting questionnaire was then administered to a separate sample of university students and confirmatory factor analysis (CFA) was employed to test the model structure. Based on research and theory suggesting that authorial identity would be associated with writing self-efficacy and critical thinking (e.g., Abasi, Akbari, and Graves 2008; Pittam et al. 2009; Elander et al. 2010; Cheung 2014), measures of critical thinking (Stupple et al. 2011) and scientific writing self-efficacy (Harbke 2007) were also completed by sub-samples of students, to assess the convergent validity of the newly developed scale. Another sub-sample completed the new scale a second time four weeks after the first time, to assess test-retest reliability.

Methods

Item generation and content validity

Interviews with a multidisciplinary sample of academics (n=27) and focus groups with students (n=14) (Cheung 2014), in conjunction with the findings of Pittam et al.'s (2009) student focus groups and a review of the literature, were used to generate an initial pool of 106 items; these were rephrased as statements that could be agreed or disagreed with. Each item was then rated on a 10-point scale for relevance to the construct of authorial identity by 15 selected Subject Matter Experts (SMEs); professional academics with extensive experience of assessing student writing, who

were familiar with authorial identity through their research and/or practice. An operational definition was provided to ensure clarity: “the sense a writer has of themselves as an author and the textual identity they construct in their writing” (Pittam et al. 2009, 153). A version of Lawshe’s (1975) Content Validity Ratio (CVR) that interpreted relevance scores greater than seven as essential to measuring the construct was then computed for each item, along with mean relevance scores. There were 59 items with mean scores lower than seven and CVRs below Lawshe’s critical values; these items were discarded, leaving 47 for further consideration, including five that were contra-indicative of authorial identity and would need to be reverse-scored. Cheung (2014) gives further details of the procedure used to generate items and assess content validity. A full list of the 106 items generated and the 47 assessed as content valid are available on request from the authors.

Participants

Separate multidisciplinary samples of 439 and 307 university students were recruited for the exploratory and confirmatory studies respectively; however, one participant in the confirmatory study was identified as an extreme outlier and removed, leaving 306 participants. For the exploratory study, the mean age was 24 years (*SD*=7.3), with a range from 18 years to 57 years. For the confirmatory study, the mean age was 23 years (*SD*=6.6), with a range from 18 years to 58 years. An overview of sample characteristics is given in Table 1.

****Insert table 1 about here****

Materials

For the exploratory study, participants provided brief demographic and educational

information, and completed a questionnaire comprising the 47 content-valid authorial identity items, with a six-point Likert-type response format labelled ‘Strongly disagree’ (1), ‘Disagree’ (2), ‘Slightly disagree (3)’, ‘Slightly agree (4)’, ‘Agree (5)’, and ‘Strongly agree (6)’. The response format did not include a neutral option; this was adopted to maximise variance detected by each item, whilst still ensuring that participants committed to a response as they would with a dichotomous response format. This allowed us to identify a latent variable model with a relatively small number of items; however, future use of the measure could use a dichotomous response format asking participants to simply agree or disagree with each statement. In a comparison of response options with and without midpoints, DeVellis (2012, 91) points out that “Neither format is necessarily superior” and we precluded participants selecting a neutral format as a means of avoiding choice.

For the confirmatory study, participants provided the same demographic and educational information as in the exploratory study, and completed a 17-item Student Attitudes and Beliefs about Authorship Scale (SABAS) that resulted from the exploratory study, using the same response format as described above. Students studying Psychology also completed the 36-item Critical Thinking Toolkit for Psychology (CritTTPsych) (Stupple et al. 2011), and those studying a science subject completed the 25-item Self-Efficacy in Scientific Writing (SESW) Scale (Harbke 2007).

The CritTTPsych is a 36-item measure of critical thinking with three factors (‘confidence in critical thinking’, ‘valuing critical thinking’ and ‘avoiding critical thinking’). Cronbach’s alphas reported for the three factors of the CritTTPsych range from .71 to .93, demonstrating high levels of internal consistency; in addition, scores on the CritTTPsych significantly correlate with critical thinking tests, suggesting acceptable convergent validity (Stupple et al. 2011). The SESW is a 27-item measure of

self-efficacy in scientific writing with six factors (‘scientific content’, ‘scientific style’, ‘formatting guidelines’, ‘literature search’, ‘data analysis’ and ‘data presentation’). Harbke (2007) reported Spearman-Brown split-half reliability estimates for the SESW subscales ranging from .80 to .95 for undergraduate samples, indicating high internal consistency.

In addition to measures of critical thinking and writing self-efficacy, the original SAQ (Pittam et al. 2009), an 18-item measure of six factors theorised to relate to authorial identity, was administered to all participants in the confirmatory study, so that the SABAS could be compared with the SAQ.

Procedure

Ethical clearance was awarded by a Psychology Research Ethics Committee at University of Derby before data collection commenced. All participants were gave informed consent to participate. They were also informed about confidentiality, anonymity in reporting and their right of withdrawal, which no participants decided to exercise after data collection.

Both studies used similar procedures to collect data; a combination of paper surveys and links on student forums to online questionnaires were used for both the exploratory study (paper=286; online=153) and the confirmatory study (paper=206; online=101). This aimed to recruit samples that were not just representative of students at one institution, or students using a particular mode of study (e.g., on-campus or online). In total, 324 participants (74%) in the exploratory study and 253 participants (83%) in the confirmatory study came from one institution; the remaining participants were studying at other UK universities but further information relating to this was not collected.

For the paper surveys, students were approached to take part at the end of teaching sessions at one UK institution. Participants were briefed about the study before completing the questionnaire in situ with no time limit, and were instructed not to confer. A link to the online version of the item pool was posted onto student forums; this included discussion boards for online teaching at one institution and forums accessed by students at other UK institutions. Data collection for both recruitment methods ran across the same term and recruited samples.

For the confirmatory study, on-campus recruitment for paper-surveys targeted different cohorts of students to those approached for the earlier study. The same cohorts were then approached four weeks later to complete a retest. Online questionnaires used an item asking about previous participation to screen out respondents to the exploratory study. In addition, online participants of the confirmatory study were asked for email addresses to contact them with a link to the retest after four weeks.

Analytic strategy

For both studies, the data were screened for missing data and a t-test was conducted to test for differences between the online data and paper responses. In the exploratory study, corrected item-total correlations were calculated for each item and those that did not correlate strongly with the total were removed. Then exploratory factor analysis (EFA) was used to identify a latent variable model for the questionnaire items. Cho, Li, and Bandalos' (2009) version of parallel analysis (PA) using polychoric correlations was used to identify the number of factors to extract. Horn's (1965) PA is a method for deciding the number of factors to extract that consistently outperforms other procedures (Ruscio and Roche, 2011; Velicer, Eaton, and Fava 2000). The technique uses Monte Carlo simulation to obtain randomised datasets with the same number of rows and columns as the empirical dataset. Principal components analysis is then used to extract Eigenvalues from each random dataset; a mean set of Eigenvalues is calculated across the iterations and compared to Eigenvalues extracted from the empirical data. Theoretically, any meaningful factor extracted from the empirical data should have a

higher Eigenvalue than its corresponding mean simulated Eigenvalue. The variant used for the current study employed a maximum likelihood method to estimate polychoric correlation coefficients between ordinal variables (Olsson 1979); these replaced Pearson's correlations normally used in parallel analysis. In addition, Glorfeld's (1995) 95th percentile criterion was used across 100 iterations, instead of Horn's original use of the mean Eigenvalue across simulations. PA with polychoric correlations and the 95th percentile criterion has improved accuracy for ordered polytomous variables when compared to other variants (Timmerman and Lorenzo-Seva 2011).

Principal axis factoring (PAF) was used to extract factors due to detected non-normality, and direct oblimin rotation was used to aid interpretation of the model. Items that did not load onto any of the factors were discarded and factor extraction was conducted iteratively until all remaining items loaded onto factors. Finally, reliability coefficients were calculated for all of the items, and the separate factors; this included the commonly used Cronbach's alpha and alternative coefficients suggested by Zinbarg et al. (2005).

Whilst Cronbach's alpha is not always the best estimate of internal consistency for ordinal Likert data (for detailed discussion refer to Cronbach and Shavelson 2004; Sjitsma 2009; Zinbarg et al. 2005), it is commonly reported for applied scale development and evaluation procedures. Traditional alpha commonly underestimates the lower bound of internal consistency for ordinal data, using polychoric alpha (Zumbo, Gaderman, and Zeisser 2007) over traditional alpha would present a stronger estimate of internal consistency, thereby preventing fair comparison of the analysis with reliability estimates for other measures of authorial identity (e.g., Pittam et al. 2009; Ballantine and Larres 2014). Despite the limitations of using traditional Cronbach's alpha with ordinal data, alpha has been shown to perform suitably when there are five or more ordinal response options.

For the confirmatory study, the data analysis employed three primary techniques: confirmatory factor analysis (CFA), Pearson's correlations, and parallel analysis (PA). CFA examined the construct validity of the 3-factor model indicated by the exploratory analysis, and a one-factor model that hypothesised a single latent variable. Further exploration of the CFA model was conducted by examining modification indices. Each modification index is an estimate of the chi-square value decrease that would result from re-specifying a model parameter; each one is accompanied by an Expected Parameter Change (EPC), which is an estimate of the value for the suggested re-specification (Kline, 2005). Saris, Satorra, and Van der Veld's (2009) method for testing misspecification significance was used to examine one misspecification in detail.

Cho Li, and Bandalos' (2009) PA using polychoric correlations was then used to confirm the number of latent variables underlying the validation dataset, ensuring that the latent variable model used was correct in terms of dimensionality, thus providing support for the model's construct validity. Cronbach's alpha coefficients were calculated as estimates of internal reliability and correlations were used to assess test-retest reliability. Pearson correlations were also used to assess relationships between SABAS scores and other measures.

Results

Missing values analyses for both datasets showed that none of the SABAS items had greater than 1% of data missing and none of the SAQ items had more than 3% missing. In addition, all cases had less than 5% of data missing. Missing values appeared to be randomly missed items from the surveys; therefore, multiple imputation (Rubin 1987) was used to replace missing data in both datasets.

Exploratory study

Mean total scores computed by summing across all 47 items did not differ significantly between paper (*M* = 229.18, *SD* = 24.64) and online participants (*M* = 232.20, *SD* = 25.75) ($t(437)=1.21$, $p=.23$, $d=.12$). The data was therefore analysed as a single dataset.

Items with corrected item-total correlation coefficients below .40 (n=14) were then removed from further analysis, leaving 33 items. The items removed included all five reverse scored items. Total scores and corrected item-total correlations were recalculated for the 33 remaining items; total score mean=154.64 (*SD*=18.53, range=68 to 196). All the remaining items had corrected item-total correlations above .40, suggesting that all items were at least moderately correlated with a single construct.

Inspection of univariate descriptives for the 33 remaining items identified substantial skew and kurtosis for some variables, indicating that the data was multivariate non-normal; therefore principal axis factoring (PAF) was used for factor extraction. The Kaiser Meyer Olkin measure and Bartlett's Test of sphericity indicated that the data were suitable for factor analysis. Polychoric PA (Cho, Li, and Bandalos 2009) was used to identify the number of factors suitable for extraction; this showed that the first three components extracted from the dataset had larger Eigenvalues than the 95th percentile of those extracted from simulated datasets. The fourth component had a lower Eigenvalue than the 95th percentile Eigenvalue from 100 simulated datasets, indicating that three factors should be extracted during factor analysis.

Three factors were extracted and rotated using a direct oblimin rotation. The pattern matrix showed that the model had a stable structure with no-cross loadings. Examination of the items and factor loadings suggested that the first factor related to confidence regarding aspects of writing, the second factor referred to the importance of writing, and the third factor related to the respondent's personal relationship with

authorship. However, there were 10 items without factor loadings above Comrey and Lee's (1992) 'fair' criterion of .45, which were removed before repeating factor extraction. The extracted model had a further five items with factor loadings < .45, which were removed from the analysis and PAF extraction was conducted again. Following this iterative process, two items with very similar wordings that both loaded on factor one were identified: 'I have my own style of academic writing,' and 'I have my own writing style'. The second, more general item was removed to leave the item that was specific to academic writing, and factor extraction was conducted again.

The 17 items in the resulting model all loaded at > .45 on one of three factors with no cross loadings above .45. Rotated factor loadings and Cronbach's alpha reliability coefficients for the final model are presented in Table 2. The factors were interpreted by examining the content of items that loaded at .45 or higher. Factor one was labelled as authorial confidence, factor two as valuing writing and factor three as identification with author.

****Table 2 about here****

Corrected item-total correlations for the 17 remaining items ranged from moderate (r=.42) to strong (r=.65) and Cronbach's alpha = .89, suggesting that the items related to the single construct of authorial identity. Alternative reliability coefficients are given in Table 3, which indicate that the 17 items collectively, and the individual subscales, are internally consistent. High values for multiple coefficients are strong evidence for reliability (Zinbarg et al. 2005). Polychoric PA (Cho, Li, and Bandalos 2009) was then conducted to confirm the validity of a three-factor model for the 17 items; this found that the first three components extracted from the data had higher Eigenvalues than the

respective components from 100 iterations of simulated data; whereas the fourth data-extracted component had a lower Eigenvalue than the fourth component from simulations. This indicated that a model with three dimensions suitably accounted for variance in the reduced 17 item dataset.

****Table 3 about here****

Confirmatory study

Data screening identified one extreme outlier, where the questionnaire had not been completed properly; this was removed, leaving 306 participants for analysis. SABAS total scores were calculated by summing scores across the items and dividing by the number of items (17). A t-test showed no significant difference in SABAS total scores ($t(304) = .73$, $p = .46$, $d = .08$) between paper ($M = 4.81$ $SD = 0.50$) and online participants ($M = 4.85$ $SD = 0.48$).

Confirmatory factor analysis

Table 4 shows the results of tests of a one-factor model and the three-factor model identified in the EFA. Both models had large exact fit chi-square statistics that were significant at the .001 level. This indicates that both models were significantly different from a model fitting the data exactly; however, this finding is common as exact fit χ^2 is extremely sensitive when data is non-normal (West, Finch, and Curran 1995), and when there is a large sample size (Tabachnick and Fidell, 2007). The other fit indices reported are those recommended by Kline (2005) and Schweizer (2010). All the indices indicate that the one-factor model fitted poorly to the data, whereas the normed χ^2 and root mean square of error of approximation (RMSEA) suggested that the three-factor model was an acceptable fit (Bollen 1989; Browne and Cudeck 1993). In addition, the standardized root mean square residual (SRMR) value for the three-factor model suggests that the

model is a good fit (Hu and Bentler 1999; Kline 2005); however, the comparative fit index (CFI) indicated poor fit (Bentler 1990), suggesting that model fit could be improved.

****Table 4 about here****

The fit indices show that the three-factor model fits the data better than a one-factor model, and that the three-factor model represents adequate fit. However, Mardia's coefficient for multivariate kurtosis was 99.85 (critical ratio = 34.36), so a bootstrap using 2000 samples was then employed with the three-factor model to take account of multivariate non-normality. As shown in figure 1, the standardised path coefficients for items and factors ranged from .45 (SABAS 01) to .83 (SABAS 17) with a mean of .63. Bootstrapped standard errors and estimated path coefficients were identical to those in the original model up to two decimal places. Bias-corrected and non-bias-corrected confidence intervals around the regression weights for estimated paths were also calculated at the 90% level; these indicated that confidence intervals would need to be 99.9% for the lower bound to be zero, evidencing an adequately fitting model.

Modification indices (MIs) and respective Estimated Parameter Changes (EPCs) were also examined for suggested re-specifications of the model. This was done cautiously, as MIs should not be used to change models without good theoretical reasons for doing so (Hooper, Coughlan, and Mullen 2008). Following Saris, Satorra, and Van der Veld's (2009) suggestion to closely examine misspecifications with EPCs greater than .2, one MI was identified as a significant misspecification, this suggested correlating the error terms between SABAS items three and four (*MI* = 38.82, 95% CI

[.14, .27], *EPC* = .21). These items are from the same factor; however, there was not a strong rationale for making the changes based on theory; therefore, the model was not re-specified to avoid exploratory use of the confirmatory analysis (DeVellis 2012). This statistically significant disturbance indicates that these two items are a source of model misfit that should be investigated with further administrations of the SABAS. Parallel analysis using polychoric correlations (Cho, Li, and Bandalos 2009) with 100 iterations confirmed that a model with three latent variables was suitable for the dataset.

****Figure 1 about here****

Internal consistency

Table 5 shows Cronbach's α for the three SABAS subscales, the six subscales of the original 18-item SAQ (Pittam et al. 2009) and the SAQ scored using Ballantine et al.'s (2013) method. The coefficients for the SABAS were all above the recommended .70 criterion (DeVellis 2012), and in the same range as the coefficients reported in the exploratory study (see table 2), whereas those for both scoring systems of the SAQ are lower and below .70 in every case.

****Table 5 about here****

Test-retest reliability

A subsample of 135 participants (44.12%) completed the SABAS four weeks after the main data collection. Table 6 shows Cronbach's alphas for the SABAS total and subscale scores at baseline and follow-up among this subsample; retest alphas more than .20 lower than initial alphas indicate significant measurement error (Nunnally and Bernstein 1994). In fact, internal consistency at retest was slightly higher than at

baseline. SABAS total and subscale scores at baseline and test-retest were all significantly correlated (see Table 6). These significant, positive and moderately strong correlations suggest temporal stability of the measure although the moderate strength of the correlations leaves open the potential for change over time.

****Table 6 about here****

Convergent validity

Correlations between SABAS total and subscale scores, and measures of writing self-efficacy and critical thinking, are presented in Table 7. As predicted, there were significant positive relationships between SABAS total scores and all five of the SESW subscales. Most of these were weak-to-moderate ($r(214)=.23$ to $.36$, $p<.01$), but SABAS total scores and self-efficacy for scientific formatting scores were very strongly correlated ($r(214)=.86$, $p<.01$). The authorial confidence and identification with author subscales also correlated weakly-to-moderately with all the SESW subscales, but the valuing writing subscale only correlated weakly with the scientific formatting and data presentation subscales of the SESW.

As predicted, there was a moderate positive correlation between SABAS total and CritTTPsych total scores ($r(129)=.53$, $p<.01$). There were weak to moderate positive correlations between CritTTPsych total and all of the SABAS subscales ($r(129)=.39$ to $.42$, $p<.01$ for all tests). There was a pattern of positive correlations between SABAS subscales and two of the CritTTPsych subscales, confidence in critical thinking and valuing critical thinking ($r(129)=.22$ to $.53$, $p<.01$). These findings suggest that the construct measured by the SABAS is positively related to critical thinking.

SABAS total scores were weakly-to-moderately correlated with all the SAQ subscales except for bottom-up approach to writing, and the SABAS authorial confidence subscale was strongly correlated with the SAQ confidence in writing subscale. There was also a broad pattern of weak correlations between SABAS subscales and SAQ subscales, except for the SAQ bottom-up approach to writing subscale, which was not correlated with any of the SABAS scores. There was a similar pattern of weak-to-moderate correlations between SABAS scores and SAQ scores using the Ballantine et al. (2013) scoring method. These patterns of correlations suggest that the SABAS measures something that is similar, but not identical to what is measured by the SAQ.

****Table 7 about here****

Discussion and Conclusion

Although the present research used the same operational definition of authorial identity as Pittam et al. (2009), the model of authorial identity represented in the SABAS has a smaller number of factors. Pittam et al.'s SAQ model identified six factors in two categories; three factors labelled 'confidence in writing', 'understanding authorship' and 'knowledge to avoid plagiarism' were conceptualised as key attributes of authorial identity, and three factors were identified as approaches to writing: 'top-down', 'bottom-up' and 'pragmatic'. The SABAS model identified in the current research resembles the first group of factors identified in Pittam et al.'s model; this is likely due to the more stringent content validity process that discarded items not deemed relevant to authorial identity by subject matter experts. Although approaches to writing are an important consideration for writing instructors (Lavelle 2007), the SABAS model

suggests that they are not a key attribute of authorial identity as a psychological construct. This is further supported by the differences between the SABAS model and the revised SAQ model proposed by Ballantine, Guo, and Larres (2013), which also included an authorial approach to writing factor.

Two of the SAQ factors identified by Pittam et al. (2009) map onto SABAS factors. ‘Confidence in writing’ has similarities to ‘authorial confidence’, and ‘understanding authorship’ is related to ‘identification with author’. Compared with Ballantine et al.’s (2013) SAQ model, the SABAS model has some similarities; firstly, both include a confidence-related factor, although the ‘lack of confidence factor’ in Ballantine et al.’s model is contra-indicative of authorial identity. Secondly, the ‘understanding authorship and plagiarism’ factor, which is similar to Pittam et al.’s ‘understanding authorship’ factor, resembles the SABAS’s ‘identification with author’ factor. However, notwithstanding the similarities above, the SABAS model represents a significant advancement on the SAQ models of previous studies. In addition, the weak relationships between SABAS and SAQ subscales show that these models of student authorial identity include considerable differences.

The SABAS model compares favourably to the two SAQ-based models in a number of ways. Firstly, items were generated for the SABAS using a systematic approach including use of qualitative data from interviews with academics (a stakeholder group ignored in previous research), and a quantitative assessment of content validity. Secondly, the SABAS factors demonstrated better internal reliability than Pittam et al.’s (2009) six factors and Ballantine et al.’s (2013) three factors. Thirdly, the methods used to test the SABAS were more rigorous than those used with SAQ models; in particular, a confirmatory study examined test-retest reliability and assessed convergent validity with self-efficacy and critical thinking. Adequate fit of the

SABAS model was demonstrated using CFA with a new sample, whereas Ballantine et al.'s confirmatory analysis was conducted with the same data used to identify the model with exploratory techniques. The approach adopted in the current research used two administrations of the SABAS to separate samples, providing stronger support for the validity of the SABAS. Finally, the use of multidisciplinary samples, compared with Pittam et al.'s sample of psychology students and Ballantine et al.'s sample of accountancy students, allows the SABAS model to be generalised and applied across multiple disciplines.

The model of authorial identity presented by Pittam et al. (2009) was developed using the SAQ. In light of the poor psychometric properties of this measure, and continuing reliance on it for authorial identity research (e.g., Ballantine and Larres, 2012; Kinder and Elander, 2012; Elander et al., 2010; Maguire et al., 2013), the aim of the present research was to develop an alternative measure for use in research and pedagogy. The SABAS fulfils this aim as it has better psychometric properties than the SAQ. Moreover, the rigorous approach to content validity and item reduction gives the SABAS a robust basis, allowing it to be used with greater confidence.

The present research answers questions raised by Ballantine et al. (2013). First, the SABAS improves the generalisability of the SAQ by presenting an alternative model designed to be applicable across disciplines. Second, the SABAS presents a more robust model of authorial identity than the SAQ, by developing the SABAS from a large item pool.

Although evidence for the SABAS's reliability and validity demonstrates that it is an improvement on previous SAQ models of authorial identity, the present findings show that the SABAS model could be further refined. In particular, more evidence is needed about validity, to help us understand more exactly the differential meaning of

each subscale. Further research with behavioural measures, perhaps including measures of student writing behaviours and analyses of students' writing, will be especially useful for that**.** Also, although the multidisciplinary sample used in the present studies was a strength, the SABAS model's position as a general framework can also be considered as a limitation. Different subject areas are likely to have nuanced deviations from the SABAS model; in fact, this could be a source of model misfit in the confirmatory analysis. Inspection of the confirmatory sample and the exploratory sample shows that there were different distributions of subjects studied by participants; this warrants further investigation of the SABAS's psychometric properties in relation to other samples.

One other source of misfit could be the order of items. The only substantial misspecification identified using Saris, Satorra, and Van der Veld's (2009) method was a disturbance between two items that were presented consecutively and load to the same factor. Administering the SABAS items in a different order could potentially improve model fit performance in future applications.

To conclude, the present research presents a new model of student authorial identity based on a psychometrically robust measure. The SABAS provides a short measurement instrument that is easily administered for further research and evaluation of authorial identity interventions. The SABAS (included as Appendix 1) and scoring instructions (Appendix 2) can be used in applied and research settings with confidence, to develop and evaluate the authorial identity approach to plagiarism.

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Appendix 1. The Student Attitudes and Beliefs to Authorship Scale (SABAS)

Please respond to each question. Check the box that best reflects your opinions and please remember there are no right or wrong answers. To what extent do you agree with each of the following statements?

		Strongly agree	Agree	Slightly agree	Slightly disagree	Disagree	Strongly disagree
1	I have my own style of academic writing.						
2	Being able to write clearly is an important part of being a graduate.						
3	I am able to document my ideas clearly in my writing.						
4	What I write communicates my confidence about the area to the reader.						
5	It is important to me that my essays are well written.						
6	I feel that I am the author of my assignments.						
7	I think of myself as an author.						
8	Academic writing is an important skill.						
9	I generate ideas while I am writing.						
10	I feel that I own my written work.						
11	I have my own voice in my writing.						
12	I feel in control when writing assignments.						
13	I am able to formulate my ideas in my writing.						
14	Academic writing allows me to communicate my ideas.						
15	I consider myself to be the author of my academic work.						
16	My ability to write academically is important to me.						
17	It is important to me to keep developing as an academic writer.						

Note: The SABAS is freely available for researchers and practitioners to use for research and pedagogic purposes. No further permissions are needed for non-commercial use.

Appendix 2. Scoring Instructions

Scoring

For all items, strongly disagree = 1, disagree = 2, slightly disagree = 3, slightly agree = 4, agree = 5, strongly agree = 6.

Subscale scores

Authorial confidence = (1 + 3 + 4 + 9 + 11 + 12 + 13 + 14) / 8

Valuing writing = (2 + 5 + 8 + 16 + 17) / 5

Identification with author = (6 + 7 + 10 + 11) / 4

Total score

To obtain a SABAS score for the entire measure, sum scores for all items and divide by 17.

Table 1. Numbers (%) of participants in demographic and educational categories

		Exploratory study *N*=439	Confirmatory study *N*=306
Gender	Male	127(28.9%)	87 (28.4%)
	Female	312(71.1%)	219 (71.6%)
Mode of study	Campus	400 (91.1%)	279 (91.2%)
	Online	39 (8.9%)	27 (8.8%)
Mature student	Non-mature	300 (68.3%)	228 (74.5%)
	Mature	139 (31.7%)	78 (25.5%)
Full time/ part time	Full time	393 (89.5%)	289 (94.4%)
	Part time	44 (10.0%)	17 (5.6%)
	Not known	2 (0.5%)	0 (0.0%)
Nationality	UK	380 (86.6%)	273 (89.2%)
	Non-UK	52 (11.8%)	29 (9.5%)
	Not known	7 (1.6%)	4 (1.3%)
First language	English	400 (91.1%)	279 (91.2%)
	Non-English	38 (8.7%)	26 (8.5%)
	Not known	1 (0.2%)	1 (0.3%)
Stage of study	First	140 (31.9%)	51 (16.7%)
	Second	182 (41.5%)	122 (39.9%)
	Third	79 (18.0%)	126 (41.2%)
	Masters	38 (8.7%)	7 (2.3%)
Subject studied[1]	Psychology	131 (29.8%)	133 (43.5%)
	Biological Science	58 (13.2%)	37 (12.1%)
	Forensic Science	37 (8.4%)	36 (11.8%)
	Education	36 (8.2%)	1 (0.3%)
	Medicine and Allied Health	28 (6.4%)	3 (1.0%)
	Music and Arts	22 (5.0%)	2 (0.7%)
	History and Cultural studies	20 (4.7%)	29 (9.5%)
	Engineering and Computing	20 (4.7%)	2 (0.7%)
	Sport Studies	11 (2.5%)	27 (9.0%)

[1]Subjects with fewer than 20 participants are not shown. For the exploratory study these were: Business, Marketing and economics 17 (3.9%); Law and Criminology 10 (2.3%); Maths and Physics 9 (2.1%); Chemical Sciences 6 (1.4%), Politics 5 (1.2%), Media Studies 5 (1.2%); English 4 (0.9%); Geography 4 (0.9%); Not known 16 (3.6%). For the confirmatory study these were: Business, Marketing and Economics 13 (4.2%); Law and Criminology 5 (1.6%); Politics 4 (1.3%); Maths and Physics 2 (0.7%); Media Studies 2 (0.7%); Geography 1 (0.3%); Not known 9 (2.9%).

Table 2. Pattern matrix of rotated factor loadings and Cronbach's alpha coefficients.

SABAS No.	Item	Factor 1	Factor 2	Factor 3
	(α =.85)			
1	I have my own style of academic writing.	**.47**	-.04	.08
3	I am able to document my ideas clearly in my writing.	**.70**	.08	-.07
4	What I write communicates my confidence about the area to the reader.	**.53**	.17	-.05
9	I generate ideas while I am writing.	**.46**	.06	.03
11	I have my own voice in my writing.	**.67**	-.19	.22
12	I feel in control when writing assignments.	**.73**	-.03	.05
13	I am able to formulate my ideas in my writing.	**.76**	.04	-.04
14	Academic writing allows me to communicate my ideas.	**.57**	.21	.03
	(α =.84)			
2	Being able to write clearly is an important part of being a graduate.	.10	**.60**	-.02
5	It is important to me that my essays are well written.	.20	**.55**	-.05
8	Academic writing is an important skill.	.08	**.69**	-.03
16	My ability to write academically is important to me.	-.07	**.84**	.13
17	It is important to me to keep developing as an academic writer.	-.09	**.78**	.13
	(α =.79)			
6	I feel that I am the author of my assignments.	-.01	.03	**.72**
7	I think of myself as an author.	.13	.07	**.46**
10	I feel that I own my written work.	.29	-.02	**.48**
15	I consider myself to be the author of my academic work.	-.06	.08	**.89**

Note: Factor loadings exceeding .45 are shown in **bold**.

Table 3. Alternative reliability estimates for 17 items and factors

	Revelle's β	McDonald's ω_h	McDonald's ω_t	Bentler and Woodward's *glb*	Guttman's λ_4	Mean score (*SD*)
All 17 items	.70	.70	.92	.93	.90	4.74 (.60)
Factor (n of items)						
1 (n=8)	.70	.72	.88	.89	.84	4.58 (.68)
2 (n=5)	.77	.80	.89	.86	.81	5.30 (.64)
3 (n=4)	.68	.78	.84	.80	.80	4.37 (.89)

Table 4. CFA goodness-of-fit indices.

Model	χ^2	*df*	Normed χ^2	RMSEA (90% Confidence Interval)	CFI	SRMR
One factor model	785.03*	119	6.60	.14 (.13 – .15)	.60	.11
Three factor model	332.06*	116	2.86	.08 (.07 – .09)	.87	.07

*p< .001.

Table 5. Cronbach's alphas for authorial identity measures in the confirmatory study.

Model of authorial identity Subscale	N of items	Cronbach's α
SABAS	*17*	
Authorial confidence	8	.81
Valuing writing	5	.79
Identification with author	4	.79
Pittam et al.'s 18 item SAQ	*18*	
Confidence in writing	5	.69
Understanding authorship	2	.10
Knowledge to avoid plagiarism	3	.54
Top-down approach to writing	2	.37
Bottom-up approach to writing	2	.40
Pragmatic approach to writing	4	.58
Ballantine et al. 's 12 item SAQ	*12*	
Understanding authorship and plagiarism	5	.63
Lack of confidence in writing	4	.54
Authorial approach to writing	3	.37

Table 6. Cronbach's alphas for SABAS scores at baseline and retest for subsample (n=135)

Subscales	Cronbach's alphas Baseline	Retest	Test-retest Correlations
Authorial confidence	.76	.87	.61*
Valuing writing	.77	.81	.62*
Identification with author	.78	.81	.58*
SABAS total score	.83	.89	.66*

*$p < .01$.

Table 7. Correlations between SABAS scores and other concurrent measures

Concurrent measure N=Number of participants	Subscale	SABAS total	SABAS subscales Authorial confidence	Valuing writing	Identification with author
Self-efficacy in scientific writing (SESW) (Harbke 2007) N=216	Scientific content	.30**	.31**	.06	.24**
	Scientific style	.28**	.30**	.04	.23**
	Scientific formatting	.86**	.39**	.24**	.56**
	Literature search	.23**	.29**	-.01	.16**
	Data computation	.36**	.45**	.04	.24**
	Data presentation	.33**	.29**	.18**	.27**
Critical Thinking Toolkit for Psychology (CritTTPsych) (Stupple et al. 2011) N=131	Confidence in critical thinking	.59**	.53**	.36**	.44**
	Valuing critical thinking	.29**	.10	.45**	.22**
	Avoiding critical thinking	-.10	-.08	.00	-.13
	CritTTPsych Total	.53**	.42**	.42**	.39**
Student Authorship Questionnaire (SAQ) (Pittam et al. 2009) N=306	Confidence in writing	.58**	.63**	.20**	.39**
	Understanding authorship	.31**	.24**	.14**	.32**
	Knowledge to avoid plagiarism	.30**	.27**	.15**	.24**
	Top-down approach to writing	.22**	.21**	.08	.18**
	Bottom-up approach to writing	-.01	.00	-.02	-.02
	Pragmatic approach to writing	-.24**	-.16**	-.25**	-.18**
Alternative SAQ subscales (Ballantine, Guo, and Larres 2013) N=306	Understanding authorship and plagiarism	.39**	.33**	.18**	.36**
	Lack of confidence in writing	-.19**	-.32**	.13*	-.13*
	Authorial approach to writing	.26*	.30*	.05	.19*

*$p < .05$. **$p < .01$.

Figure 1. Path diagram of the bootstrapped three-factor SABAS CFA model