Cambridge Journal of Education, 2013
Vol. 43, No. 2, 199–222, http://dx.doi.org/10.1080/0305764X.2013.767878

Routledge
Taylor & Francis Group

How should researchers in Education operationalise on-task behaviours?

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(*Received 23 May 2012; final version received 14 December 2012*)

On-task and off-task behaviours have been used in educational research either as independent topics of interest or as dependent variables. In clinical research, there is general agreement about what constitutes off-task behaviours but no such agreement exists for on-task behaviours. This paper reviews 54 studies spanning the last 22 years in order to examine how on-task behaviour has been defined in the educational literature. From the 54 studies, 25 different on-task behaviours were identified. The 25 on-task behaviours were assessed to see if they could be allocated to a category. Four categories of behaviours were identified: task-related, teacher-related, social and miscellaneous. Building on the analysis from the identification and categorisation of the behaviours, the paper suggests a checklist of behaviours that differ in degree of how necessary they are to include in research when using on-task behaviours as a dependent measure. The paper concludes by suggesting that, although on-task behaviours can be highly and appropriately idiosyncratic, educational researchers can achieve some systematicity of measurement by using the guidelines presented.

Keywords: on-task behaviours; off-task behaviours; engagement; collaborative learning

Introduction

Student behaviour in learning environments has been shown to have a strong influence on academic achievement (Appleton, Christenson, & Furlong, 2008; Harper, Guidubaldi, & Kehle, 1978; Rotgans & Schmidt, 2011). The relationship between behaviour and achievement has led to an interest in defining the difference between particular types of behaviours, namely 'on-task' and 'off-task' behaviours. Although some researchers have commented on the differences between these behaviours and achievement (e.g. Kilian, Hofer, Fries, & Kuhnle, 2010), operationalising these behaviours in educational settings, and especially what constitutes 'on-task' behaviours, has been remarkably varied. In this paper, we examine how on-task and off-task behaviours have been used in educational research with a view to offering a set of criteria researchers can usefully work with when trying to operationalise such behaviours.

Beeland (2002) suggests that 'student engagement is critical to student motivation during the learning process' (p. 2). Such a claim begs the question 'what constitutes engagement?' When looking at the range of behaviours that constitutes

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engagement, what actually exists is a number of intuitive descriptions. For example, Fredricks, Blumenfeld, and Paris (2004) identified effort and persistence as proxies for student engagement. And herein lies the crux of this paper because one of the most common measures of student engagement has been on-task behaviours, it is curious why the term has been used with so much variation. As outlined later (see Table 1) there are a wide range of behaviours that have either been labelled as 'on-task behaviours' or taken the direct leap and labelled themselves as 'student engagement'. The implications for having such a variety in definition and operationalisation of terms are potential reductions in both reliability (of the constructs) and validity of the studies that use these constructs. Measures need to be consistent if they are to be reliable and although construct validity is always contestable in the social sciences, a level of agreement as to what constitutes a particular construct is both useful and welcome.

The alternative argument is that on-task behaviours are by their nature idiosyncratic and do not warrant operational systemisation. In each context, the on-task behaviour will be different depending on the task; there is little to be gained in trying to force criteria on to a set of behaviours that are self-evident. The purpose of this paper is to examine how far this latter position may be true by assessing whether there may (or may not be) patterns in the way researchers have used the construct 'on-task' behaviour. The aim is to arrive at a greater opaqueness around the concept of student engagement and more precisely, a useful and usable set of operationisations of on-task behaviours.

One particular feature of researchers' use of the variable 'on-task behaviours' is that measures tend not to be based on previous theory. Often researchers decide what constitutes a good measure of on-task behaviour without considering prior research. Such tactics are understandable when taxonomies of on-task behaviour and validated constructs for on-task behaviour are not available. For example, researchers interested in studying intrinsic motivation have a suite of questionnaires, behavioural indicators and validated operationalisations of that construct (Deci & Ryan, 2012). Researchers studying on-task behaviours have no such repository. A key purpose of this paper is to potentially provide such a repository.

Differences in the application of on-task and off-task behaviours

Although some researchers have combined the use of on-task and off-task behaviours in their examinations of student engagement (e.g. Berliner, 1979, 1990; Bulger, Mayer, Almeroth, & Blau, 2008; Golley *et al*, 2010; Lentz, 1988), the most salient difference between the applications of on-task and off-task behaviours is that the former has often been applied to educational contexts, whereas the latter has had a greater influence in the clinical literature. It is not entirely clear why this is. One possibility is that in clinical research, behaviours that underpin development conditions, e.g. inattentive behaviour, hyperactivity and conduct disorders need to be categorised according to criteria set out in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) published by the American Psychiatric Association. The DSM provides a common language and standard criteria for the classification of mental disorders. Also, in keeping with much research in clinical settings, the randomised control trial has been a common method of investigation and because this technique advocates the standardisation of data collection techniques as a matter of course, clear operationalisations of behaviours need to be specified.

Table 1. Previous applications, categories and appropriateness of 'on-task behaviours'.

			Categories of on-task behaviour				Applicability of behaviours to learning contexts			
1 Rank	2 Behaviour	3 Fr.	4 Task-related	5 Teacher-related	6 Social	7 Miscellaneous	8 Necessary in all learning contexts	9 Individual learning contexts	10 Collaborative learning contexts	11 Inappropriate for capturing on-task behaviour
1	Oriented physically towards teacher/ task	15	X	X			X			
2	Paying attention to teacher	14		X				X	X	
3	Working with/ responding to teacher	11		X				X	X	
4	Appropriately seeking help	11		X	X			X	X	
5	Concentrating on task	10	X				X			
6	Appropriate use of task materials	10	X					X	X	
7	Remaining in seat	10			X			X	X	
8	Following directions	10		X	X			X	X	
9	Writing	8	X					X	X	
10	Eyes focused on work	8	X					X		
11	Working quietly	8	X		X			X		
12	Reading	6	X							
13	Absence of off-task behaviour	6				X				X
14	Engagement	6	X					X	X	
15	Task-related talk	5	X						X	

(*Continued*)

Table 1. (*Continued*).

			Categories of on-task behaviour				Applicability of behaviours to learning contexts			
1 Rank	2 Behaviour	3 Fr.	4 Task-related	5 Teacher-related	6 Social	7 Miscellaneous	8 Necessary in all learning contexts	9 Individual learning contexts	10 Collaborative learning contexts	11 Inappropriate for capturing on-task behaviour
16	Participating in class activity	5	X						X	
17	Asking task-related questions	4	X	X				X	X	
18	Listening	4	X				X			
19	Behaviour appropriate to learning situation	3			X		X			
20	Following class rules	2		X	X		X			
21	Transition from one activity to another	2	X					X	X	
22	Waiting to receive attention	2			X			X	X	
23	Student perceived to be on task	2				X				X
24	Shows an interest in learning	1				X				X
25	Activity that facilitates task completion	1	X					X	X	

In line with need to standardise behaviours, in a study using the DSM in an educational setting, Atkins, Pelham, and Licht (1988) developed the Classroom Observations of Conduct and Attention Deficit Disorder (COCADD) observation scheme. Later, Pelham *et al*. (1993) adapted the COCADD to measure classroom behaviours and academic achievement whilst manipulating dosage of a drug (methylphenidate). Reliability of the measure was achieved through weeks of repeated observations and the achievement of uniformly high inter-rater kappa coefficients. What this study highlighted was the effectiveness of standardising off-task behaviours so that they could be used to investigate clinical phenomena within the remits, limits and requirements of the DSM. In addition to Pelham and his colleagues, McConaughy *et al*. (2009b) assessed attention deficit hyperactivity disorder (ADHD) in a standardised fashion using the Direct Observation Form (DOF). The DOF measure provides a comprehensive list of 89 off-task behaviours, allowing observers to systematically and reliably record student actions that can be used to help diagnose attention deficit disorders. However, as with the COCADD observation scheme, the DOF does not categorise on-task behaviours; instead observers are provided with tick boxes to check if they *perceive* students to be on task. What the examples of studies into ADHD show is that many clinical studies use the classroom as context for research and as such strict operationalistions of on-task behaviours are not just restricted to clinical settings.

What is striking from the work completed using the DSM as an underlying set of principles for operationalisations is the methodical way in which off-task behaviours are coded in order for diagnoses to be made. The methodological processes for recording on-task behaviours are far less formalised. Whilst there is no set criteria such as the DSM, there have been some educational projects that have introduced their own coding schemes for classroom behaviours that are of interest, two of which will be identified in the following section. What the rigour and consistency with which off-task behaviours are operationalised does point to is (a) the importance of being able to measure behaviours in a systematic fashion and (b) the ability to complete such a task. When one contrasts the operationalisation for off-task behaviours with the ways in which on-task behaviours are typically investigated, the lack of systematicity in defining on-task behaviours becomes curious. This is not to say that there is no systematicity, just that the starting point for educational researchers seems to be an idiosyncratic assessment of context and requirement potentially leading to concomitant variation in operationalisation. In this paper, we examine how far on-task behaviours have been applied systematically. The aim of the analysis is to separate out common from idiosyncratic features. It is hoped that such an analysis can provide a set of useable criteria that educational researchers can refer to when using on-task behaviours in their research.

On-task behaviour: Examples from Education

In education, on-task behaviour has been used as a proxy for engagement, and because engagement has been a key variable for intervention studies, many studies have investigated whether the interventions increase on-task behaviour. For example, Bonus and Riordan (1998) examined the effects of specific seating arrangements on on-task behaviour. Participants' low observed levels of on-task behaviour were believed to be related to the layout of the classroom and proximity

to the teacher. In line with this assumption it was found that a modification to the seating arrangement resulted in higher levels of 'on-task oral responses' and 'on-task behaviour' (1998, p. 21). Allday and Pakurar (2007) also investigated how a given intervention can increase on-task behaviour by looking at the effect of teacher greetings. In this study, it was hypothesised that a failure to interact with students during the early stages of a lesson leads to off-task behaviour, so teacher greetings were introduced, resulting in greater intervals of on-task behaviour (seeking help more appropriately/asking more questions in class). Whilst these studies undoubtedly produced interesting findings, the ways in which the phenomenon is operationalised represents a contrast to those utilised when investigating off-task behaviour. One could suggest that if on-task behaviour is to be regarded as an appropriate proxy for engagement, then it should have a more systematic operational definition for its use as a dependent variable.

A similar set of criticisms about the operationalisation of on-task behaviour can be levelled in clinical research when we look at the rare occasion where on-task behaviours have been used. In one example, Vandenberg (2001) used on-task behaviour as a dependent variable to measure the effectiveness of weighted vests on individuals suffering from ADHD. In this study six, 15-minute observations were conducted of participants with or without weighted vests. The results showed that wearing a weighted vest led to significantly more on-task behaviours relative to when the vest was not worn. The authors rightly identified the limitations of generalisibility, explaining that the results were, at the time of writing, only applicable to that observational context. However, the issue of construct validity regarding the dependent variable itself was not raised. In Vandenberg's study on-task behaviours were defined as 'engagement in those processes that were necessary to complete the activity assigned by the teacher and were a part of the expected process' (2001, p. 624). Whilst Vandenberg's methods may have been appropriately applied within the specific empirical situation, there was no offer of an explanation as to why the measures of on-task behaviour that they used could be considered to be valid or reliable. It should be noted that throughout the current paper, when comments relating to construct validity are made, what is really being referred to is a lack of information being provided to the reader regarding the validity of the measures that have been employed; the issues surrounding validity within educational research are too numerous to be addressed in depth here (for a review, see Lissitz & Samuelsen, 2007). Often, limited information is provided as to the context of the learning activity itself, the behaviours deemed 'necessary' or the theoretical justification as to why these behaviours were chosen. When researchers include constructs (e.g. self-esteem, ability, intrinsic motivation) in their research, we immediately look for the evidence that supports the validation of these constructs. It is therefore curious why researchers who use on-task behaviour rarely justify their selection of behaviours as dependent variables.

At this point it would be appropriate to outline a couple of exceptions to the statements made regarding a lack of contextual information and systematicity within the measurement of on-task behaviour. The first of these exceptions relates to the ORACLE studies (observational research and classroom learning evaluation). ORACLE was a project completed in the decade following the Plowden Report (1967) and lasted for five years, observing children over their final two years of primary school. The original ORACLE studies and their more recent replications (for a review, see Galton, Hargreaves, Comber, Wall, & Pell 1999) have been invaluable

for deconstructing what is actually going on in primary classrooms from both the teacher's and pupils' points of view; demonstrating the complexity surrounding each class environment, and the ways in which the characteristics of each classroom will result in the behaviours, attainment and engagement observed. Observations have been made that highlight policy changes that affect teacher behaviour, which in turn affects time with students. In addition, differences over time have been recorded, with a notable shift being identified towards an increased amount of time pupils are engaging in task-related activities in groups as opposed to individually.

The results of the ORACLE studies have undoubtedly been highly influential (and far too numerous to discuss here). Because of this, researchers have been keen to replicate many parts of the project, however, the ability to achieve this accurately is dependent on the clarity of the measurement definitions used. Galton and his colleagues describe the difficulties associated with measuring task-related activities as they defined task-related activities as being 'fully involved in the task' (1999, p. 89), and then went on to admit this was something of a 'catch-all' definition (1999, p. 89). With this in mind there appears to be a need within the educational academic community for a methodological discussion regarding the capture of on-task behaviour.

Another notable exception to the study of on-task behaviour in the classroom comes from Alexander's (1995) book entitled *Versions of Primary Education*, which details the implementation and results of the Primary Needs Independent Evaluation Project (PRINDEP) that involved a host of observations and interviews within 60 primary schools within Leeds. With regards to on-task behaviour, Alexander and his colleagues categorised pupil behaviour as 'working', 'routine', 'awaiting attention', 'distracted' or 'not observed', they also provide example definitions of behaviours that would fit into these categories. Using this method it could be determined that the pupils in the PRINDEP studies spent 59% of their time working on the tasks that had been assigned to them. The details of the PRINDEP project provide further evidence that it is possible to engage in systematic observation of on-task behaviour, whilst also appreciating and detailing the complex situational factors that need to be incorporated in order to make a reliable classroom observation possible.

Both the PRINDEP and ORACLE projects identify important points regarding the operationalisation of on-task behaviour, notably that it is possible to reliably and systematically capture on-task behaviour within the classroom. It is this relationship between the research and the classroom environment that has inspired much of the current paper. Whilst psychological literature focuses on developmental symptoms, Alexander details the areas of the classroom environment that directly affect the ways in which a measure of on-task behaviour could be conceived. Specifically, he explains that issues such as the nature of the task itself, teacher to pupil ratios and class sizes all interact with, and to some extent determine the ways in which pupils behave in the classroom. What this does is it not only separates educational from clinical enquiry, but also highlights that any appropriate coding scheme needs to be adaptable so that it can accommodate the large number of situational and contextual factors that make each classroom unique. What is therefore frustrating is that, whilst systematicity and clarity are possible, justification for decisions regarding operationalisations are rarely provided by researchers.

It is understandable that whilst researchers have their own understandings of, and perspectives toward any given concept, problems can arise when the reader is provided with insufficient detail. Such lack of detail is evident in a piece of

research conducted by Mahar *et al*. (2006) in which the benefits of a classroom-based physical activity programme were evaluated based on the effect on on-task behaviour. In this study on-task behaviours were defined as 'verbal or motor behavior that followed the class rules and was appropriate to the learning situation'. This definition was borrowed from Katz and Singh (1986) and Shimabukuro, Prater, Jenkins, and Edelen-Smith (1999), suggesting an application of previous theory regarding the definition's development. However when referring back to Katz and Singh, and Shimabukuro *et al*., it can be seen that the above definition of on-task behaviour had been constructed and applied in a context-dependent manner. One could suggest that using the same definition in a different context was not ideal, as Mahar *et al*. would have experienced differences in classroom environment, activity and sample population to the context in which the original definition was developed. The pattern that tends to develop in the literature therefore is the development of context-dependent measures of on-task behaviours that are difficult to evaluate beyond face validity, yet are employed by others on the basis that the measure may offer some form of theoretical foundation for their research. This observation naturally leads to the question: can on-task behaviours be reliably captured in a way that applies to a number of different teaching contexts? If not, then do the on-task behaviours differ greatly, so that individual measures need to be developed each time in order to capture behaviours unique to each classroom?

Purposes and aims of analyses

The purpose of this paper was to examine examples of on-task behaviour used in educational research to assess whether a level of systematicity can be suggested for future research. In the first stage of analysis for this paper, we identified 54 studies that included the investigation of on-task behaviour in order to get a picture of how on-task behaviours have been operationalised by researchers in educational settings. In stage 2, the types of on-task behaviour reported in those 54 studies were assessed to see if they could be placed in specific categories of on-task behaviour. In stage 3, behaviours and categories were assessed to see if they could be categorised in terms of necessary and sufficient conditions (identifying behaviours that may be essential to the capturing of on-task behaviours). From this analysis it was hoped that we could provide a set of principles and guidelines that will help educational researchers operationalise on-task behaviours in a more systematic and consistent manner.

Methods

Search procedure for generation of Table 1

In order to develop a catalogue that accurately reflects the body of research that specifically investigates on-task behaviour, a focused search method was used. In line with criteria set out by the EPPI-Centre, free search terms were initially entered into the academic database ERIC, followed by an identical search of the database PsycINFO. ERIC was chosen as the primary database due to its extensive holdings of applied educational literature. PsycINFO was used as a secondary database in order to identify other papers published in the social sciences.

The free search terms entered into the databases were 'on-task behav∗' (with the asterisk being used as a wildcard to avoid the bias of any national spelling and to ensure the inclusion of permutations such as 'behaviour', 'behaved', 'behavioural') and 'AND' 'classroom'. The search term 'classroom' was added to ensure the studies had been conducted in an educational setting (a point that was directly related to the aim of the study). The inclusion policy was that both search terms had to be present in the abstract of the studies. By limiting the search to the abstracts it was understood that the number of results would be reduced, as some of the studies would likely include the terms searched within their literature reviews, without such material being relevant to the current paper. Limiting the search to the abstract was therefore considered appropriate due to the need to ensure the relevance of study with regards to the focus on on-task behaviour.

The database searches that were conducted limited the results to peer-reviewed documents of any format published between 1990 and 2012. The specification of those dates was to ensure that papers chosen for analysis reflected current practice. The specification of peer-reviewed publications was to ensure quality; it was believed that significance of results (or lack thereof) would have little bearing over the ways in which on-task behaviour had been defined, and so the 'file drawer problem' was deemed not to be an issue. The papers were sorted according to 'relevance'. ERIC returned a total of 63 titles, whilst PsycINFO returned 177 titles (although the majority did not relate to on-task behaviour despite the above detailed search criteria). Examples of papers returned that fulfilled the search criteria but did not strictly relate to the measurement of on-task behaviour in a classroom environment include Mahar (2011) which is a paper on 'attention-to-task' in 'classroom-based physical activities', Ainsworth *et al*. (2011) and Fonagy *et al*. (2009) which focused on 'off-task behaviour', and Thijs and Koomen (2008) which measured independence and persistence. Full texts of the articles found were accessed through the author's institution's library, as well as through a document delivery service provided by the British Library. The papers were reviewed in order to determine if on-task behaviour had indeed been a focus of the study, and if so, how the authors defined the term and then went on to operationalise that definition. This method generated 61 unrepeated, relevant studies.

Of the 61 papers identified as relating to on-task behaviour, six were not deemed to be relevant and so were not included any further in the investigation. The first of these was a paper where on-task behaviour was mentioned only once in the introduction, the study itself examined 'on-time' behaviour (Caldarella, Christensen, Young, & Densley, 2011). In another paper, Wheeler, Pumfrey, & Wakefield (2009) presented results regarding an intervention aimed at reducing ADHD symptoms; on-task behaviour was not directly addressed. Similarly an article by Polirstok and Gottlieb (2006) was investigating a particular intervention not directly related to on-task behaviour. A meta-analysis of classroom inattentiveness (Kofler, Rapport, & Alderson (2008) included on-task behaviour as a search term but this was not a focus of the study and so was not included in the current review. In addition, Starkman's (2007) article on classroom acoustics, and Burkhart's (2006) paper on material culture in art education were not empirical studies of on-task behaviour and so were also excluded from further review. Finally, the full text of a paper by Warren, Dondlinger, Stein, and Barab (2009) was found to be unavailable and so was not used to contribute to the review.

After necessary omissions, a total of 54 studies were available for inclusion. The operational definitions of the final 54 studies were subsequently extracted and used to develop Table 1. It is worth noting at this stage that due to the amount of variance in the wording used by the authors of the included studies, some operationalisations were reworded slightly to allow for categorisation. For example, terms such as 'student was visually attending to play materials, [and] visual instructions' (Mavropoulou, Papadopoulou, & Kakana, 2011) were included alongside other such terms in a behaviour entitled 'Eyes focused on work'. In such cases of rewording, all definitions and operationalisations retained their entire qualitative meaning.

Results from stage 1: identifying the range of on-task behaviours

Columns 2 and 3 of Table 1 outline the types of behaviours that researchers have used when examining what they have defined as on-task behaviours. Each behaviour has been given a number and the behaviours have been ordered so that the most prevalent behaviours appear at the top. In this sense, the number of the behaviour is also its rank in terms of frequency. The 54 papers obtained for this analysis generated 25 distinct behaviours that were identified by the researchers as being those behaviours that were measured in order to determine the presence of on-task behaviour. As Table 1 shows, 'oriented physically towards teacher/task' was most often identified as representing on-task behaviour. Of the 54 studies, 10 (19%) of them offer no operationalised definition of on-task behaviour; rather they simply state that this is the phenomenon that they have measured.

The mean number of behaviours identified in each study was 3.1, with a standard deviation of 2.4. These results highlight the relatively low number of operationalisations made by many of the investigators. In fact, of these 25 behaviours, the majority of the studies employ no more than 4. With relatively few behaviours being employed, and so many being identified, the findings suggest considerable variability amongst researchers as to what constitutes on-task behaviour.

Discussion: identifying the range of on-task behaviours

The findings from columns 2 and 3 of Table 1 are largely unsurprising. One would expect a large number of distinct behaviours across studies compared to a relatively low number of behaviours within studies because each study will have been investigating something different. However, a further analysis of the behaviours reveals some potential for systematicity. Table 1 reveals that, 'oriented physically towards teacher/task' (1) was the most commonly identified behaviour amongst the studies reviewed. Whereas this is obviously an important aspect of learning (Werthamer-Larrson, Kellam, & Wheeler, 1991), it could be a prerequisite to engaging with a task-related activity rather than a direct indicator of a student being on task at a particular point in time. For example, a student may be thoroughly disengaged whilst facing a teacher or interactive whiteboard. Further evidence is shown by the importance placed on 'paying attention to teacher' (2). For example, 'sit still and be quiet' is obeying a teacher instruction but it is unlikely that the behaviour could be classed as on-task. Perhaps this is a reflection of the methodological techniques often used in the classroom education literature. Much research utilises teacher ratings and teacher observations (Protheroe, 2002; Teddlie *et al.*, 2006; Van Tassel-Baska, Quek, & Feng, 2006), with many measurement instruments being influenced

by teacher input. This may go some way to explain the emphasis placed on including 'paying attention to teacher' (2) in coding schemes. Certainly it is conceivable for students to be able to engage with their task without previously listening to the teacher. What the issue of using just 'paying attention to teacher' (2) does show, however, is the importance of having multiple items to code for on-task behaviour, otherwise the coding scheme itself could both under- or over-estimate the level of on-task behaviour and therefore subsequent conclusions about students' engagement.

The second interesting finding was that 10 of the 54 (19%) studies used offered no operational definition of on-task behaviour at all. The act of operationalising a term of interest is an extremely important part of the empirical research process as it allows for not only the clarification, but also the measurement of a concept. The omission of adequate construct definitions has two significant consequences for the individual studies and the wider investigation of on-task behaviour. The first of these consequences is potentially poor construct validity. In social sciences, construct validity is problematic enough but failure to operationalise behaviours at all means that behaviours become just idiosyncratic. Later we discuss how there is room for some idiosyncrasy when dealing with on-task behaviours but good research across all paradigms should at least define behavioural terms in some way, providing clarity for the reader, as well as providing the means for replication. The variability between the papers reviewed demonstrates that on-task behaviour can be seen to represent different things to different researchers, depending on the focus of their study. Therefore maximising the validity of the measurement criteria by stating specifically the behaviours being coded is an essential aspect of the study of on-task behaviour.

Questionable construct validity leads to the second consequence of failing to state operationalisations, and that is that it makes replication extremely difficult. If on-task behaviours are to be captured in a methodical and robust manner then one would need to be able to assess the stability and representativeness of the behaviours identified. This would include developing systematic and reliable definitions that can be applied to other studies. In order to do this, the reliability of construct definitions, as well as empirical results, would need to be evaluated, primarily through replication. The finding that 10 studies omitted a definition criteria for their dependent variable makes it difficult to add such findings to a theoretical base for research into on-task behaviour because the concept in such studies lacks clarity.

The lack of clarity is also reflected by the finding that most of the studies identify no more than four behaviours as identifiers of on-task behaviour. One potential explanation for this is that the operationalisations used for each study are a reflection of the specific classroom context being observed. For example, of the studies included in Table 1, Trolinder, Choi, and Proctor (2004) appear to capture an intuitive interpretation of what can be considered to be on-task behaviour. This study operationalises the variable with four measurable behaviours ('oriented towards teacher/task' (1), 'appropriate use of task materials' (6), 'remaining in seat' (7) and 'engagement' (12)). When one thinks about the behaviours exhibited by students engaging with an academic task, it is likely that these four behaviours would represent much of that vision (a point reaffirmed by the relative frequency values of the behaviours in Table 1). Indeed as academic achievement is obviously contingent on being able to concentrate on completing a task, the behaviours identified by Trolinder *et al*. can be seen to be important. However, with only four out of 25

behaviours being identified in the study conducted by Trolinder and her colleagues, this begs the question 'what are the other 21 behaviours capturing that are so distinctly different from these four seemingly important behaviours?'

An explanation as to why the coding scheme for on-task behaviour of Trolinder *et al*. has not been replicated by all researchers is that it represents what may contribute to learning in a very narrow environment, namely a traditional learning context. Whilst the four behaviours identified by Trolinder *et al*. appear to have high face validity, they may be considered to represent a fairly exclusive definition of on-task behaviour. Of the four behaviours identified, they are all 'task-related'; by which it is meant that the definition of on-task behaviour given by Trolinder *et al*. is oriented towards the frequency with which the students interact with their given activity. Demonstrating that investigating on-task behaviour in different learning contexts affects the ways in which on-task behaviour can be operationalised highlights the importance of deconstructing and defining the terms being used as dependent variables. Whilst the verbatim meaning of 'being on task' should predominantly represent engaging with an academic activity, there are other ways in which researchers have interpreted 'the task'. For example, rather than a task being identified as the immediate tangible academic activity, the wider task may be considered to be engaging in a wider learning context such as interacting with the teacher in order to further understanding. An example of how altering the way in which the concept of the task itself can be interpreted comes from the differences between the observations of Trolinder *et al*. and a study conducted by Nelson, Kohnert, Sabur, and Shaw (2005). These researchers investigated the effects of classroom noise and defined on-task behaviours consisting of three 'teacher-centred' behaviours, i.e. 'paying attention to teacher' (2), 'following directions' (8) and 'asking task-related questions' (17). Therefore it seems that in some cases the ways in which on-task behaviour is defined and operationalised is dependent on the field of study itself, the focus of the researchers and the role of the teacher within the investigation.

The range of behaviours shown in Table 1 clearly shows considerable variability in the operationalisation of on-task behaviour. But as exemplified by the study of Trolinder *et al*., on-task behaviours can be appropriately idiosyncratic. In the next stage of the analysis, we explored whether the 25 on-task behaviours identified in Table 1 could be grouped in any meaningful way.

Results from stage 2: Identifying categories of on-task behaviours

The 25 behaviours presented in Table 1 were assessed thematically by the first author. The behaviours were reviewed in order to determine whether any common themes could be identified. Within this it was noted whether individual actors were mentioned, and if so who these individuals were, whether there was any link to standardised practice such as class rules or a merit system, whether the behaviour was physical or verbal, and any other commonalities that emerged. This analysis revealed four qualitatively different categories. The categories are presented in columns 4–7 of Table 1.

Columns 4–7 of Table 1 show that the category identified with the highest number of behaviours is the one labelled 'task-related'. This makes intuitive sense in so much as the researchers intended to measure on-task behaviour. This task-related category includes 14 of the 25 behaviours and these appear to represent coding

measurements whereby a student is predominantly oriented towards their work or given activity. Examples include 'concentrating on task' (5), 'engagement' (14) and 'writing' (9). The second category identified consists of seven behaviours that are clearly focused on the relationship between the pupil and the teacher. The category was labelled 'teacher-related'. Examples include 'following directions' (8) and 'asking task-related questions' (17). A third category of behaviours appears to be concerned with adhering to the social rules or established code of practice in the classroom. The category was labelled 'social'. Examples include 'following class rules' (20) and displaying 'behaviour appropriate to learning situation' (19). Finally, there are three behaviours ['student perceived to be on task' (23), 'absence of off-task behaviour' (13) and 'shows an interest in learning' (24)] that have been categorised as 'miscellaneous' because they appear to stand alone, with no similarities to the other behaviours.

Discussion: identifying categories of on-task behaviours

The findings from columns 4–7 of Table 1 present a contrast to the ways in which on-task behaviour has been conceptualised by researchers. The identification of task-related behaviours, teacher-related behaviours and social behaviours is novel and warrants further attention. The concept of categorising on-task behaviours is not altogether a new one. On occasion some researchers have identified their definitions of on-task behaviours as being either active or passive (Junod *et al*., 2006 ; Kemp & Carter, 2006; Ockjean & Hupp, 2007; Shapiro, 1996). In such cases, active on-task behaviours may consist of actions such as 'writing' (9) or 'working with/responding to the teacher' (3), whereas passive behaviours include 'eyes focused on work' (10) and 'listening' (18). This distinction can be particularly useful when researchers are investigating the amount of time a student dedicates to a particular behaviour, but the criteria by which behaviours can be classified as either active or passive are often difficult to discern.

The current identification of qualitatively different 'types' of on-task behaviour (i.e. task-centric or teacher-centric) points toward an understanding of on-task behaviour that is determined, at least in part, by the topic of investigation or the intervention being tested. For example, Gilbertson, Witt, Duhon, and Dufrene (2008) were briefly assessing interventions regarding mathematics fluency and on-task behaviour in order to evaluate their effectiveness. Their study was task-centric, focusing on the ways in which the students engaged with the interventions. Accordingly, their operationalisations of on-task behaviour were unilaterally task-based (behaviours included 'engagement' (14), 'eyes focused on work' (10) and 'working quietly' (11)). What the relationship between topic of investigation and definitions of on-task behaviour suggests is that researchers are often not necessarily striving to determine how an intervention acts upon on-task behaviour as a whole; rather they are interested in how their intervention modifies the behaviours that they have chosen to investigate in that given context.

The suggestion that the topic of investigation can influence operationalisations says that the definitions of on-task behaviour provided in much research do not always fully represent on-task behaviour, so much as they simply represent the presence or absence of those particular operationalisations. What we are suggesting is that whilst the behaviours that have been identified in this paper and have contributed to the construction of columns 4–7 of Table 1 are representative of the lit-

erature reviewed, they do not represent a comprehensive deconstruction of on-task behaviour. In other words, there is more to on-task behaviour than the selection of behaviours included in each individual investigation. An assumption is that a number of the operationalisations listed are not entirely helpful as identifiers of on-task behaviour. Specifically, the 'miscellaneous' items appear to offer no significant understanding as to what constitutes on-task behaviour and could therefore be discounted. For example, 'student perceived to be on task' (23) is a rather cyclical operationalisation that would appear to be of limited use without knowing details of the individuals who were coding the students' behaviour, and their understanding of the term on-task behaviour. In addition, one could also question the validity of 'shows an interest in learning' (24) as being an indicator of a student being on task due to the inevitable reliance on the perceptions and interpretations of the observer (s). An argument can be made for the desire to have clearer, more salient operationalisations for the observers to work with.

Furthermore, within the 'task-related' category, 'Engagement' (14) is listed. On-task behaviour is consistently assumed to be an indicator of engagement, and so the creation of a circular definition by suggesting that engagement can be used to indicate on-task behaviour is probably unhelpful. What is clear when examining the behaviours listed in Table 1 is that, intuitively, some of them appear to be more indicative of what one may traditionally consider to be on-task behaviour than others. For example, in some contexts, 'writing' (9) would be considered to be more indicative of on-task behaviour than 'asking task-related questions' (17). The point here is to return to the concept of context, and highlight that in any given educational setting, how a pupil can display being 'on task' is inherently related to both the task itself and the learning environment.

What might be useful for educational researchers looking to use on-task behaviour as a measure in their research is a table that can be referred to that identifies in which contexts certain operationalisations of on-task behaviours either should, can or should not be used. Columns 8–11 of Table 1 represent such a table.

Results from Stage 3: Creating a checklist for educational researchers looking to use on-task behaviour as a measure in their research

In columns 8–11 of Table 1, we have taken each on-task behaviour and assessed in what contexts the behaviours could be deemed appropriate. In column 8, we identify behaviours that all researchers should use when examining 'on-task' behaviours regardless of context. These (we suggest) are 'must measure' behaviours. Columns 9 and 10 are differentiated by studies that focus on two categories of research. Column 9 refers to a 'traditional learning environment'. In a traditional learning environment a body of knowledge is transferred directly from an *expert* to a *learner*. In contrast, collaborative learning environments have been defined by Roschelle and Teasley (1995, p. 70) as 'A coordinated activity that is the result of a continued attempt to construct and maintain a shared conception of a problem'. Unlike column 9, column 10 refers to situations where on-task behaviour involves the task but also participants' interactions with their group. The contexts for columns 9 and 10 are clearly not exhaustive of all possible educational research environments where on-task behaviours might be examined but these two categories did differentiate the 54 studies used for this paper. The final column represents behaviours we do not consider to be (useful) measures of on-task behaviours.

Taking column 8 first, in Table 1 it can be seen that there are five behaviours that we consider *necessary* for a student to be on task. For example, one would struggle to envision a situation whereby a student was on task, without being oriented towards that task. For column 9 there are 14 behaviours. Of these, 12 are shared with column 10. For column 9, note that we suggest that behaviours 10 ('Eyes focused on work') and 11 ('working quietly') are exclusive to this column. For the 14 behaviours in column 10, note that we suggest that behaviours 15 ('task-related talk') and 16 ('participating in group activity') are exclusive.

Discussion: Creating a checklist for on-task behaviour

It is evident that there are a number of behaviours that are necessary for a researcher to conclude that on-task behaviour has been observed, however this does not necessarily mean that they are sufficient, and this is where the differences in context become so important. In an exam environment for example, 'writing' (9) would be considered to be necessary and would therefore need to be included, whereas 'task-related talk' (15) is likely to be forbidden. With regards to a collaborative learning environment, a much greater focus would likely be placed on social interaction, suggesting the inclusion of behaviours such as 'task-related talk' (15) and 'participating in class activity' (16). In contrast, however, having ones 'eyes focused on work' (10) would not be a prerequisite as the group's construction of knowledge is not dependent on that behaviour. It is important to draw the distinction between necessity and sufficiency, as it influences the way individuals would utilise any checklist. What is suggested here is that researchers may want to include all of the necessary behaviours in their individual measure of on-task behaviour, but then it would also be important to include other behaviours listed as well, that are suitable for the education/learning context, within which the observations will be taking place. It is thought that including those necessary behaviours, and then also adding to them, will result in measures of on-task behaviour that are both fit for purpose, and adaptable to a wide variety of learning environments.

One important point that should be noted here relates to feasibility of being able to include some of the behaviours identified in any given measure of on-task behaviour. To some extent the abilities of researchers to look for certain behaviours in the classroom are limited by the observational techniques employed in the study. For example, a team of observers using a traditional pen and paper recording method would have to make individual data entries, the quality of which may be influenced by factors including the position of the observer in the classroom, or the focus of the observer at any given moment in time. For this reason, a researcher employing this method may choose to define on-task behaviour in terms of the most salient of operationalisations, e.g. 'oriented physically towards teacher/task', 'working quietly' and 'remaining in seat', thus giving the observers the best chance of identifying the behaviours. In contrast to this, video and audio recording equipment allows for multiple observations, both of physical behaviours and verbal interactions. Such technologies allow a researcher or team of researchers to identify subtle behaviours or interactions that might otherwise go unnoticed. It is quite possible that this increase in observer sensitivity may influence the researchers' decisions regarding operationalisations. For example, a researcher may choose to include 'task-related talk' in their definition criteria if their observers are able to review transcripts of conversations between students.

It is clear that whilst two of the behaviours identified in the current paper ('Oriented physically towards teacher/task' 1: and 'Concentrating on task' (5)) have been used frequently as operationalisations, and are both fairly easily observable using traditional observation methods, there are other behaviours listed in Table 1 as being 'necessary in all contexts' that may be more easily captured using recording equipment. For example, behaviours 19 and 20 ('Behaviour appropriate to learning situation' and 'Following class rules') both rely on the observers' understanding of secondary factors (e.g. behaviour appropriateness and specific classroom rules). In addition, much group work involved in collaborative learning contexts include complex interactions that would be captured more reliably if multiple viewings were possible. Thus it is understood that the ability for researchers to observe particular behaviours in different learning contexts will be mediated to some extent by the provisions made for recording the classroom/group environment. It is hoped that as recording equipment becomes increasingly more accessible, behaviours that are clearly necessary for the presence of on-task behaviour will be included more often in definition criteria, subsequently increasing both the reliability and validity of the data collection process.

General discussion

The purpose of this paper was to examine the range of operationalisations that have been used to examine the construct 'on-task behaviour' with a view to assessing whether we could provide a set of principles and guidelines that would enable educational researchers to consider the operationalisation of on-task behaviours in a (more) systematic and consistent manner.

Columns 1–3 of Table 1 confirmed the variability in the way on-task behaviour has been operationalised and our analysis suggested that there was room for both idiosyncrasy *and* systematicity. Columns 4–7 of Table 1 took these ideas forward and divided the behaviours in context-relevant categories. This phase of the analysis was relatively crucial because it allowed us to show how contexts are important in educational research. Columns 8–11 of Table 1 built on the conclusions from the previous analyses to offer a suggested checklist and was the crux of the paper. Columns 8–11 of Table 1 allowed us to present the case that whilst there was a balance to be considered by context, on-task behaviours could be categorised into what was necessary and was sufficient for inclusion in educational research. A key feature of Table 1 is column 11, the category of behaviours that were classed as not on-task behaviours. This did not mean the behaviours were unimportant, just that they should not be classed as on-task behaviours.

What the checklist presented does is illustrate the fact that by creating and employing definitions of on-task behaviour based on the perceived need of the individual research project, there is the potential for behaviours to be observed that are neither necessary nor sufficient for determining the extent to which a student is on task. The suggestion, therefore, is that a checklist such as the one presented in columns 8–11 of Table 1 could be employed when considering on-task behaviour as a dependent variable. The individual research team needs to be able to clarify, in the given research environment, specifically what behaviours are likely to be necessary for the student to be identified as being on task. With such information in hand, the researcher is in a far stronger position to be able to develop a reliable and applicable coding scheme. With a strong foundation of necessary behaviours, one's coding

scheme can then be expanded by including other behaviours that may not be as necessary, but may potentially prove to be indicators of on-task behaviour. Including a number of relevant behaviours in a coding scheme will help expand the scope of observation so that the definition is prevented from being too limited. What is equally important, however, as indicated in Table 1, is that behaviours that are unlikely to represent on-task behaviour in a particular context are not included in a coding scheme. Whilst some behaviours may be intuitively linked to a researcher's conceptualisation of learning in general, the effect of context on the transfer and construction of knowledge has been well documented (Dillenbourg, 1999; Dillenbourg *et al*., 1995; Panitz, 1999; Sins *et al*., 2011). For this reason it is important for researchers to only observe those specific behaviours that are conducive to the type of learning that occurs in each environment (e.g. group construction of knowledge in a collaborative learning environment); avoiding the inclusion of behaviours that would not represent on-task behaviour in such an environment.

Unfortunately, it is beyond the scope of the current study to prescribe which behaviours should or should not be used in all learning environments. What this paper does is identify the key behaviours researchers need to look to. Subsequent papers will include investigations into the optimal protocols for conducting a study examining on-task behaviour, as well as adding to the literature of Alexander (1995) and Galton, Simon, and Croll (1980) by considering the nature of 'the task', as well as the organisational factors that no doubt affect the ways in which classroom behaviours can be measured and interpreted. We hope this paper provides a useful template to be included in the tool-kits of researchers planning to examine on-task behaviour.

Limitations

The current paper has worked towards identifying current definitions of on-task behaviour and suggesting in what contexts such behaviours should and could be used. There are however, limitations associated with the paper. One such limitation is that, as mentioned previously, some of the operationalisations of on-task behaviour provided by the studies reviewed had to be slightly reworded in order to allow for categorisation. Whilst in all cases the operationalisations retained their qualitative meaning, and it is not felt the rewording altered the results in any way, it would have been preferable for this not to have been necessary. Indeed this paper acts to minimise the necessity for researchers to alter definition terminology by providing a checklist of behaviours that can be referred to if individuals so choose. An ideal situation for the study of on-task behaviour in general would be if definitions consisted of classroom behaviours that were consistent across studies, allowing for clear comparisons between studies to be made within the literature.

A second limitation of the current paper is that all of the contributing studies have come from only two databases, ERIC and PsycINFO. Clearly a larger literature search including more databases would yield a considerable number of other studies that could have potentially been included in this paper. Whilst this is almost certainly true, a particular feature from the findings in this paper is the considerable overlap and repetition amongst the various operationalisations of on-task behaviour. In other words, although there is variety in the way on-task behaviour has been studied, the commonalities seem to be more prevalent than the idiosyncrasies. It is therefore felt that adding more studies to the 54 reviewed in this paper may offer

more examples of on-task behaviour but probably little in the way of new insights in terms of the conclusions drawn from the analysis in this paper.

A similar point can be made regarding the decisions relating to the terms selected for the database searches. It is certainly true that the literature investigating the observation of task-related behaviour extends beyond the verbatim of 'on-task behaviour'. It is entirely feasible that other search terminology may have resulted in different definitions of the similar concepts. To address this a series of secondary searches were completed using alternative terms such as 'time-on-task', task-related' and 'task-avoidance'. In total, approximately 40 studies were reviewed that would have only acted to reinforce, rather than call into question, the results presented in the current paper. The majority of studies offered no definitions of concepts, whilst those that did operationalised their concepts in almost identical ways to those presented in Table 1. The one notable exception to this was Walker, Audette, and Algozzine (1998) who applied the Stallings Observation System. Their 'classroom snapshot', used to calculate time-on-task, was based on more than 10 operationalised behaviours, some of which were quite general whilst others were highly context specific. What can be concluded from this is that whilst there does appear to be a lack of clarity and systematicity regarding classroom behaviours, as detailed in this paper, moving forwards to remedy the situation will require extending the focus beyond one single search term and instead taking into account many terms that are thought to represent the 'concept' of on-task behaviour.

The defences offered to the limitations raised argue that the incorporation of more data will act to reinforce rather than criticise the current paper's findings. This is not to suggest that a review of other studies that have sought to capture on-task behaviours is unwelcome. Indeed, we would encourage researchers to comment on the nature of on-task behaviour because, in our view, the measure seems to be a taken-for-granted almost self-evident truth type of measure. There are clearly theoretical and empirical debates that we hope this paper will inspire. However, in relation to the terms of reference we have set out for this paper, our suspicion is that extra studies would be more likely to reinforce the observations and claims made in this paper.

Conclusion

Sometimes developing guidelines can be an excuse to standardise rather than a need to standardise. What the evidence and analysis in this paper suggests is that the usage of the construct 'on-task behaviours' is highly variable. However, within the considerable variability there is also considerable consistency in the types of behaviours researchers examine. What this paper does is to bring together the variability and common themes and combine these with context to show that it is possible to provide a set of guidelines that can be referred to when researchers are planning their studies.

We do not expect all researchers to agree with our guidelines. Indeed, as this paper represents the first systematic analysis of the construct in education, we welcome additions and revisions. On-task behaviours represent an important construct in educational research, so finding ways to represent the construct in more robust and systematic ways without taking away the context-specific nature of educational research seems an important task to undertake. It is unlikely that on-task behaviours will ever be defined as precisely as off-task behaviours are in the DSM, but that

does not mean we should not strive to see where commonalities can be usefully applied. We hope the analyses in this paper provide a robust and valuable reference point for educational researchers looking to use on-task behaviours in their research.

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