Paper 054: Models of internal, school-based assessment: challenges and possibilities

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Key words: Coursework; School-based; Assessment

Abstract
This paper summarises a number of studies that have explored the challenges posed by the need for reliable, valid and manageable internal assessment models. Research at Cambridge Assessment has investigated school-based assessment across a range of contexts including: coursework and controlled assessment; practical assessment across a range of subjects; and speaking and listening in Modern Foreign Languages (MFL). While skills such as creativity, communication, reflective thinking and independent learning are difficult to assess in traditional written examinations, they are fundamental to students' futures (Suto, 2013; Tremblay and Le Bot 2003). Current reforms in England look likely to result in a reduction in the extent of internal assessment although it is expected to remain in subjects where it is the only way to assess key elements in those subjects. This paper provides an overview of research undertaken and discusses implications for the development of future assessment models. The challenge will be to learn lessons from the past and to develop effective, manageable models for the future.

Introduction
This paper focuses on internal school-based assessment (SBA) models and the challenges posed when this form of assessment is included in qualifications in an attempt to assess important skills that are difficult to assess through written examinations. The title itself raises a number of questions about definitions of SBA and the ways in which this kind of assessment can be incorporated within a qualification in a valid and reliable way. Tensions exist between the need for valid assessment of relevant skills that are important to students in their learning and for their futures in the world of work and the need for reliable assessments that are trusted and robust. In England, there are difficulties arising from the assumption that direct assessment of important elements of learning is always necessary to ensure that they are taught. The aim of this paper is to discuss examples of SBA and to provide some historical detail about ways in which it has been re-designed over time in England. The intention is to reflect on some of the research that has informed change and to highlight what has been learned so that future practices and processes can be informed by lessons learned from the past.

The rationale for the introduction of SBA relates to the type of learning that is assessed and the range of knowledge, skills and information that can be addressed in a model of assessment that does not rely on traditional written examinations to represent attainment. Some important skills such as creativity, communication, independent learning and team work are difficult to assess whilst they are key to students' future success in their education and in the world of work. Similar problems arise where subject specific skills are more difficult to assess. Such skills can include fieldwork skills in Geography, drafting and re-drafting text in English and practical work in Chemistry. It is therefore important that such areas of learning are assessed so

that their importance can be recognised and rewarded. This aim was stated by the Secondary Examinations Council (SEC[1], 1985, p.2) as 'making what is important measurable rather than making what is measurable important'. Other imperatives include the need to assess process as well as product and to motivate students through the use of authentic tasks. We can enhance validity by introducing models that allow us to assess a wider range of knowledge and skills in more authentic contexts but we need to balance this aim against the need for acceptable levels of reliability.

Coursework assessment

In the late 1980s coursework was a requirement in many subjects as part of the General Certificate of Secondary Education (GCSE[2]). Students completed tasks and activities within their learning experiences in the classroom which were then marked by teachers and externally moderated by an Awarding Body (AB). The involvement of teachers in assessing students' work in the UK began long before the 1980s. Kingdon and Stobart (1988) in Crisp (2010) report that teacher assessment of practical note books was part of the High School Certificate in England before the First World War (1914 to 1918). Over the intervening years the definition of 'coursework' has changed. In its earliest form it consisted of work completed as part of a course of study with examples of students' work selected for assessment to represent their best performance across a range of skills. In 2006 the Qualifications and Curriculum Authority (QCA[3]) reported that there were some concerns about coursework, including the unreliability of teacher marking, potential plagiarism and inappropriate levels of assistance from others. Such concerns undermined stakeholders' trust in the value and integrity of the qualifications. The nature of the tasks was also a cause for concern as they became more formulaic and hence less authentic and less personalised, contrary to the original intentions of the coursework model. An additional problem was the students' workload which threatened the manageability of coursework across a range of subjects. This final concern was a key issue that led the Department for Education and Skills (DfES[4]) to task the QCA with a review of coursework (see DfES, 2005). Students, parents and teachers were surveyed (Ipsos MORI 2006; QCA, 2005; 2006a, 2006b). The views expressed in the surveys were mixed. Coursework was considered important in subjects that involved oral and practical work and the benefits of coursework were recognised (Ipsos MORI, 2006) particularly in relation to the positive impact on teaching and learning (QCA, 2005). Concerns about teachers' marking workload, authenticity of students' work and the burden on students were viewed negatively. The outcomes of the review were influential in QCA's decision to remove coursework from GCSE Mathematics, and to replace coursework with controlled assessments in other GCSE subjects.

Controlled assessment

'Controlled assessment' is the approach to internal assessment where an AB sets requirements or 'controls' for setting tasks; taking tasks; and marking tasks (QCA, 2007, p.3). The controls for these three elements of the assessment could be set as high, medium or limited. Table 1 sets out the key issues for controlled assessment.

[1] The SEC was the successor to the Schools Council and oversaw qualifications in England, Wales and Northern Ireland from 1982 to 1988.

[2] GCSEs are taken in a wide range of subjects by the majority of students in England during Year 11 (age 16).

[3] The QCA was replaced by the Qualification and Curriculum Development Agency (QCDA) and The Office of Qualifications and Examinations Regulation (Ofqual) in 2009.

[4] The DfES was a UK Government department between 2001 and 2007, responsible for the education system and children's services in England.

Table 1: Linked processes in controlled assessment (QCA, 2007 p. 3)

Process	Key issues to address
Task setting	• making assessments more valid and reliable • avoiding assessments that are too formulaic and predictable • supporting good teaching and learning • making assessment more manageable for students and teachers
Task taking	• discouraging and detecting assessment malpractice • allowing teachers to confidently authenticate students' work • making assessment more manageable for students and teachers
Task marking	• ensuring assessment judgements are of highest quality

Colwill (2007) later added a 'Training' area of control following his independent review of controlled assessment. He defined this as:

> *... the need for guidance and training to enhance the accuracy and reliability of teacher judgement, to enable teachers to prevent plagiarism and to reduce the extent of teacher help in writing assignments.* *(p.15)*

Controlled assessments were designed to focus on constructs that were different from those assessed in written examinations in order to enhance the validity of the assessment. Crisp and Green (2013) investigated the effects of the change from coursework to controlled assessment in GCSEs. They explored: the authenticity of student work; the impact on learning; and the practical challenges of implementation.

The research involved a questionnaire survey targeted at teachers of six focus subjects[5]. For each subject 250 schools/colleges were selected at random from those entering candidates in June 2011. A questionnaire was sent to 1,500 Heads of Department with extra copies included where there were more entries so that more teachers could be invited to take part. A total of 346 teachers responded representing a range of experience and school types. The focus subjects and the number of responding teachers for each were:

- Design and Technology: Resistant Materials (N = 34);
- French (N = 64);
- Geography (N = 79);
- History (N= 64);
- Home Economics: Child Development (N = 29);
- Physical Education (N = 53).

The findings from the study suggest that the introduction of the controls had led to greater trust in the authenticity of student work although the risks had not been entirely removed. Consistency between schools was still considered to be a problem due to differences in the type and amount of help that students received and the ways in which the controls were interpreted. A key theme of the research was how teaching and learning had been affected by this model of assessment. Crisp and Green (2012) reported that teaching did change as did the knowledge and skills gained by students.

[5] Details of the research method and results can be found in Crisp and Green, (2013, p.683).

Although most reported effects were negative, there were some positive comments such as those relating to the development of independent skills and enquiry.

Workload issues for students and teachers continued to be a problem in the controlled assessment model as it had been in traditional coursework. A range of practical problems were also reported, for example, timetabling and computer access. The need for greater control also posed problems as students needed supervision if they had been absent for their scheduled assessment sessions. In 2012, The Office of Qualifications and Examinations Regulation (Ofqual[6]) conducted a subject by subject review of controlled assessment (Ofqual, 2013). The need to look at separate subjects was supported by findings from Crisp and Green (2012) that there were subject differences, for example, in the challenges reported in Modern Foreign Languages. The Ofqual findings highlighted some key issues including the fact that controlled assessment was often a measure of a student's ability to memorise and produce pre-prepared work under exam conditions. Another concern focussed on problems of consistency, especially in high stakes subjects which were included in accountability measures. It was also significant that 73 per cent of respondents thought that controlled assessment did not encourage depth and breadth in teaching. Practical difficulties were also reported for example, accommodation, Information Communications Technology (ICT) facilities and equipment. Duplication between written examinations and controlled assessment was also an issue especially where 60 per cent of the marks were awarded for controlled assessment.

Based on the findings of the review Ofqual developed a set of principles to apply in reformed GCSE qualifications. They stated that non-exam assessment:

- *should be used only when it is the only valid way to assess essential elements of the subject;*
- *must strike a balance between the valid assessment of essential knowledge and skills, sound assessment practice and manageability;*
- *arrangements should be designed to fit the requirements of the particular subject, including the relative weighting of written exams and other components;*
- *should be designed so that the qualification is not distorted by external pressures.* (Ofqual, 2013, p.4)

Cambridge Assessment research into models of internal assessment

In light of the reform agenda in England and the principles outlined above a programme of research is being undertaken at Cambridge Assessment to inform qualifications reform. One of the strands of research has focussed on internal assessment in a range of contexts including Practical Science, Modern Foreign Languages and practical assessment in other subjects.

Assessment of Practical Science: a Literature Review (Watts, 2013)

In his review, Watts (2013) reports on a discussion about whether current forms of summative practical assessment in England enable students to learn how Science

[6] Ofqual regulates qualifications, examinations and assessments in England and vocational qualifications in Northern Ireland.

really works. In her summary of this work, Wilson (2013) comments on tensions between the importance of teaching and learning practical skills and the need for them to be assessed as part of the GCSE qualification:

> *Constraints are imposed on the assessment of practical skills by the procedures which are required to ensure standardisation when a subject is assessed as part of a national examination scheme. These constraints can undermine the pedagogical aims of practical science. For example, concern about assessment tasks may divert attention from learning towards the demands of the assessment.* (p.6)

Watts reports that there is support for SBA among the Science community and that one solution could be to assess some practical skills, such as processing and presenting data, through a written examination and to reduce the range of skills which are assessed by internal assessment whilst also encouraging all types of practical work during the Science course. Holman (2013) addresses these challenges in a policy note written for the Gatsby Charitable Foundation[7] and the Wellcome Trust[8]. He recognises the importance of the development of students' practical skills and the need for them to be included in qualifications. However, he questions the current GCSE model whereby students complete two or three investigations under highly controlled conditions from those set by ABs. He proposes that in the long term practical work should be assessed directly by teachers as he found in his study in countries such as China, Singapore and Finland. However, he realises that there are challenges associated with this model in the shorter term due to political and pragmatic problems that would be difficult to resolve in the current system. This leads him to the conclusion that there should be a combination of questions in a written paper that assess practical skills, learned through carrying out experiments during learning programmes, coupled with teachers' assessments of technical and scientific skills evidenced during the course and endorsed by teachers and head teachers. This is a model supported by Oates (2013) which would ensure that the assessment would encourage the teaching and learning of important skills as part of the learning programme.

In his review of literature on the assessment of Practical Science Watts (2013) comments that it is likely that:

> *New solutions will simply be a result of reprocessing ideas that have been [previously] tried. The bringing together of these ideas in a novel way will be what will create any new system. This will require a good eye for how a scheme will work out in practice.* (p.51)

The potential solutions reported here provide starting points for the exploration of new possibilities and the opportunity to learn from the difficulties posed by past and existing models of assessment.

[7] The Gatsby Charitable Foundation is an endowed grant-making trust, based in London, UK, founded by David Sainsbury in 1967.
[8] The Wellcome Trust was established in the UK in 1936 as an independent charity funding research to improve human and animal health.

Controlled assessment in Modern Foreign Languages (French, German and Spanish)

As reported earlier, another subject area where controlled assessment posed significant problems was MFL. Crisp and Green (2012) found that problems reported in their questionnaire survey by teachers of French in England were more significant than those reported by teachers of other subjects. They found that unlike teachers of other subjects, more French teachers responded that the risk of plagiarism had increased with controlled assessment. Over 80 per cent of French teachers also reported a reduction in teaching time. Evidence from Johnson, Mehta and Rushton (2012) suggests that there are significant logistical difficulties for teachers, especially in larger institutions. Timetabling posed greater difficulties in French possibly due to the need to schedule an oral session for each student. Problems of increased workload and administration were also greater in this subject.

Johnson, Mehta and Rushton (in submission) identified some of the challenges posed by the model in a study conducted by Mehta, Johnson, Rushton and Child (2013) on the impact of controlled assessment in the GCSE speaking component of MFL qualifications. The focus on speaking resulted from difficulties reported in previous research in this area and the problems of assessing less tangible outcomes. Mehta *et al.* used a mixed methods approach incorporating focus groups, case studies and a survey in three phases from January to October, 2012. The research questions included:

1. How do teachers prepare for controlled assessment of speaking in MFL?
2. What is the impact of controlled assessment of speaking on teachers and students?
3. What support can be provided to the teachers as they implement controlled assessment?

The methodological details can be found in Mehta *et al.* (2013). In 2009 the method of assessing speaking changed from a formal speaking examination to a series of tasks for which Ofqual set the requirements, although teachers were allowed to set their own tasks. Teachers were allowed to set an unlimited number of tasks but only two could be submitted for the final assessment. As students prepared for the tasks teachers were only allowed to give general feedback and were not allowed to practice with the students. Teachers conducted and marked the performances using mark schemes provided by the AB. The performances were assessed internally and were externally moderated by the AB.

Participants felt that their teaching was improved by the fact that they were given some control of the task design, albeit limited, and that this allowed them to exercise some professional creativity. Some teachers reported that they built differentiation into their tasks rather than depending on outcomes to differentiate between their students. One method of achieving this was through the use of open ended tasks. There were mixed views from teachers about their confidence in their own marking but there was a consensus around the importance of understanding mark schemes and sharing knowledge with colleagues. Concerns were expressed about the emphasis that controlled assessment placed on rote learning and that there was an increased danger of narrowing teaching and learning activities with less flexibility in the students' language use.

An overview of practices in practical assessment (Mehta, 2013)

Further research was carried out at Cambridge Assessment to investigate the structure and nature of practices in practical assessment across a range of subjects in GCSE qualifications. The aim of this work was to gain insights into how such assessments were functioning in different subject areas so that lessons could be learned for the development of new qualifications. The subjects investigated by Mehta (2013) included Design and Technology, Engineering and Geography. Information was gathered from the OCR[9], Edexcel[10] and AQA[11] websites about:

- overall assessment structure;
- internal assessment of practical skills including details about type of assessment;
- task setting;
- task completion and task marking;
- external assessment of practical skills.

The proportion of internal assessment varied across subjects. In most cases students were allowed to undertake initial preparation and research under limited supervision, but were expected to complete the final task under direct and formal supervision. Tasks were specified by the ABs with task performances internally assessed and then moderated by the AB. There were examples of the external assessment of practical skills. These included:

- assessment of candidates' designing and making skills in a timed task in design and technology;
- written exams testing application of technological skills and knowledge in engineering;
- written exams testing cartographic skills in Geography.

Tables 2, 3 and 4 provide an overview of the structure and balance of internal and external assessment of practical skills involved in three subjects offered by OCR in 2012. In all three subjects some of the assessment is carried out under exam conditions including the production of a prototype product in Design and Technology. Preparatory work, including research, has only limited or informal controls. The weighting of internal and external assessment varies as does the number of units of practical assessment within the qualification. In each of the subjects the AB is responsible for setting the tasks but there is some flexibility for schools to determine the context and the finer details of the tasks. The subject models exemplify the attempt to ensure consistency while also allowing some freedom for individual schools.

[9] OCR (Oxford Cambridge and RSA) is an Awarding Body in England, Wales and Northern Ireland, established in 1998.

[10] Edexcel is an Awarding Body in England, Wales and Northern Ireland, established in 1996. Pearson has been the parent company of Edexcel since 2003. In 2010, the legal name of the Edexcel Awarding Body became Pearson Education Limited (Pearson).

[11] AQA (Previously, Assessment and Qualifications Alliance) is an Awarding Body in England, Wales and Northern Ireland, established in 2000.

Table 2: Summary of Assessment of Practical Skills in Design and Technology (OCR, 2012a)

Internal: 60%		
Controlled assessment; 1 unit – creating portfolio, 1 unit - creating a prototype product.		
Level of control specified	**Task setting**	OCR - tasks can be contextualised by school.
	Task completion	Preparation – informal supervision; Research – limited supervision; Final task – formal supervision.
	Task marking	Internally assessed; moderated by OCR.
External: 40%		
Exam conditions – 2 x 3-hour sessions – no teacher intervention. Task: Design and create an innovative product. Photographs recording progress - answer booklets for external assessment.		

Table 3: Summary of Assessment of Practical Skills in Engineering (OCR, 2012b)

Internal: 60%		
Controlled assessment; 1 unit – product analysis and prototype.		
Level of control specified	**Task setting**	OCR - tasks can be contextualised by school.
	Task completion	Preparation – informal supervision; Research – limited supervision; Final task – formal supervision.
	Task marking	Internally assessed; moderated by OCR.
External: 40%		
Written exam to test practical application of knowledge relating to products and engineering environments.		

Table 4: Summary of Assessment of Practical Skills in Geography (OCR, 2012c)

Internal: 75%		
Controlled assessment; 1 unit - collection of primary data to conduct a local geographical investigation.		
Level of control specified	**Task setting**	OCR sets task titles. Candidates formulate specific questions.
	Task completion	Research and data collection - limited supervision; Final task - formal supervision.
	Task marking	Internally assessed; moderated by OCR.
External: 25%		
Written exam on Geography skills - map reading, analysis and use of ICT.		

Conclusion

Current reforms in England are likely to lead to a reduction in the amount of non-examination assessment in GCSE qualifications. Despite the fact that many problems related to internal assessment are reported in the literature it is interesting to note that in their research Crisp and Green (2013) found that 71.6 per cent of respondents to their survey felt that internal assessment was 'important' or 'very important' in their subject. Teachers suggested a number of potential improvements in the model. These included, fewer tasks, a reduction in the number of changes to tasks, and improved guidance on controls, task requirements and marking criteria. It is questionable whether such changes would resolve the tensions created by the demands placed on qualifications as part of an accountability system where schools and teachers are judged by their students' results whilst at the same time they are responsible for marking internal school-based assessment that contributes to students' grades. Oates (2013) identifies this problem:

> *On the one hand [teachers'] performance must continually improve, and on the other they must be impartial and reliable assessors. This leads to a highly conflicted professional role regarding internal assessment.* (p.2)

This issue has led to the introduction of unintended consequences into the system. Oates discusses a number of radical solutions to overcome some of the difficulties raised in this paper and recognises the importance of identifying what we need to assess, what can best be assessed through practical assessment and what can be assessed by other means. The ideas discussed in his paper support the importance of teaching and learning with assessment that is fit for purpose. The aim is to develop optimal methods which will create the right balance between teaching, learning and assessment while also relaxing the tensions between them for students, teachers and ABs.

There are many challenges to face when internal SBA is included in qualification systems. It is important to determine at the outset why internal assessment is necessary and what the optimal assessment model might be to achieve the desired aim. One overarching aim is to design and manage assessment to ensure desirable wash-back effects into the curriculum. It may be that in some subjects there are elements of learning that cannot be assessed validly through written examinations and therefore some form of SBA is the only way to ensure that those learning objectives receive the focus that they merit. The danger is that if they are not assessed they may not be taught appropriately given the potential for unintended consequences of an assessment led curriculum. This rationale leads to the challenge of ensuring consistency in the interpretation of the rules and guidelines associated with the implementation of internal assessment. Linked to this are the difficulties of assuring reliability of marking and the authenticity of students' work. In this paper some of the historical context has been outlined and examples of challenges in different subjects have been reported. This overview has highlighted the fact that different problems arise in different subjects and that any decisions about whether internal assessment should be included in qualifications must be considered on a subject-by-subject basis.

The research reported in this paper provides an overview of some of the studies carried out at Cambridge Assessment as part of the Qualifications Reform Research Programme. The aim of the programme is to inform discussions about the

development of future assessment models in the context of the current reforms underway in England. Although it is likely that there will be a reduction in internal assessment, there are persuasive arguments to support its retention in some subjects. The challenge will be to learn lessons from the past and to develop effective manageable models for the future.

References

Colwill, I. (2007). *Improving GCSE: internal and controlled assessment.* Qualifications and Curriculum Authority.

Crisp, V. (2010). *The judgement processes involved in assessing GCSE coursework.* Unpublished PhD thesis. Institute of Education, University of London.

Crisp, V. & Green, S. (2012). Controlled assessments in 14-19 Diplomas: Implementation and effects on learning experiences. *Educational Research and Evaluation: An International Journal on Theory and Practice,* 18:4, 333-351.

Crisp, V. & Green, S. (2013). Teacher views on the effects of the change from coursework to controlled assessment in GCSEs. *Educational Research and Evaluation: An International Journal on Theory and Practice: 19:8*, 680-699.

Department for Education and Skills (DfES). (2005). *14-19 Education and Skills (White Paper).* London, UK.

Holman, J. (2013). In *The Gatsby Charitable Foundation and the Wellcome Trust Policy Note: Assessment of Practical Work in Science (2013).* Retrieved from http://www.gatsby.org.uk/Education/Projects/Review-of-Practical-Science-in-Schools.aspx

Ipsos MORI. (2006). *Teachers' views on GCSE coursework: Research study conducted for the QCA.* London, UK. Qualifications and Curriculum Authority.

Kingdon, M. & Stobart, G. (1988). *GCSE examined*. Lewes: Falmer Press.

Johnson, M., Mehta, S. & Rushton, N. (2012). *GCSE Modern Foreign Language (Speaking Component) Controlled Assessment Research Project.* Cambridge Assessment Internal report.

Johnson, M., Mehta, S. & Rushton, N. (in submission) Assessment, aim and actuality: insights from teachers in England about the validity of a new language assessment model. *Pedagogies: An International Journal*.

Mehta, S. (2013). *An overview of practices in practical assessment.* Cambridge Assessment Internal Report.

Mehta, S., Johnson, M., Rushton, N. & Child, S. (2013). *'Three is company', using a mixed methods approach to evaluate the effects of controlled assessment on MFL speaking & listening.* Paper presented at the Annual Conference of the British Educational Research Association, (BERA) University of Brighton, September 2013.

OCR (2012a). *GCSE 2012 D&T: Product Design Specification J305-Full Course Version 1, April 2012.* Cambridge: OCR (Oxford Cambridge and RSA). Retrieved from http://www.ocr.org.uk/images/82446-specification.pdf

OCR (2012b). *GCSE 2012 Engineering Specification J322-Single Award Version 2, August 2013.* Cambridge: OCR (Oxford Cambridge and RSA). Retrieved from http://www.ocr.org.uk/images/74468-specification.pdf

OCR (2012c). *GCSE 2012 Geography A Specification J382 Version 1, August 2012.* Cambridge: OCR (Oxford Cambridge and RSA). Retrieved from http://www.ocr.org.uk/images/82576-specification.pdf

Oates, T. (2013). *Radical solutions in demanding times: alternative approaches for appropriate placing of 'coursework components' in GCSE examinations.*

Cambridge Assessment. Retrieved from http://www.cambridgeassessment.org.uk/Images/145830-coursework-radical-solutions-in-demanding-times-.pdf

Qualifications and Curriculum Authority (QCA). (2005). *A review of GCE and GCSE coursework arrangements.* London, UK.

Qualifications and Curriculum Authority (QCA). (2006a). *GCSE mathematics coursework: Consultation summary*. London, UK.

Qualifications and Curriculum Authority (QCA). (2006b). *A review of GCSE coursework*. London, UK.

Qualifications and Curriculum Authority (QCA). (2007). *Controlled Assessments.* London, UK.

Office of Qualifications and Examinations Regulation (Ofqual). (2013). *Review of Controlled Assessment in GCSEs.* Coventry, UK.

Secondary Examinations Council (SEC). (1985). *Working Paper 2: coursework assessment in GCSE*. London: Secondary Examinations Council.

Suto, I. (2013). 21st Century skills: Ancient, ubiquitous, enigmatic? *Research Matters: A Cambridge Assessment Publication,* 16, 2-8.

Tremblay, D-G. & Le Bot, I. (2003). *The German dual apprenticeship system: Analysis of its evolution and present challenges.* Research Note No. 2003-4A. Télé-université, Université du Québec. Retrieved from http://www.teluq.uquebec.ca/chaireecosavoir/pdf/NRC03-04A.pdf

Watts, A. (2013). *The Assessment of Practical Science: a Literature Review.* Cambridge Assessment Internal Report.

Wilson, F. (2013). *The Assessment of Practical Science: a Literature Review Summary.* Cambridge Assessment. Retrieved from http://www.cambridgeassessment.org.uk/Images/135793-the-assessment-of-practical-science-a-literature-review.pdf