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The Authenticity of 'Authentic' Assessment

Some Faculty Perceptions

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Abstract— The attempt to embed Authenticity within the learning process in higher education has been a driving principle within many pedagogical approaches to Higher Education developed over the past three decades. The desire to allow students to learn in a manner that closely resembles the way in which expertise is developed outside the academic environment is a central element of problem-based, inquiry-based and project-based learning. Exploring the implications of authenticity for student achievement and the ways in which this should be assessed has led to innovative teaching methods and ways of evaluating student performance. Unfortunately, authenticity, and authentic assessment in particular, are concepts which are open to a range of interpretations, not least in an educational context where they may be used by both teachers and students with a variety of meanings. This paper investigates the working definitions of authentic assessment used by teaching staff within a Computing department in one U.K. university. We begin by giving an overview of some relevant aspects of authentic learning, which, historically, draws on pedagogies such as situated learning and social learning theory. We then focus on authenticity in the assessment process and describe a number of models which have been used to identify elements that contribute to this range of meaning. We analyse the descriptions of authentic assessment given by academic staff in terms of these concepts and suggest a framework which can be used to integrate the responses and characterise staff understanding of the authenticity. We then briefly compare these findings with other work investigating student responses to the same question and draw conclusions concerning the relevance of these factors on curriculum development, the use of assessment to drive learning and the role of staff development in promoting positive change in these areas. Finally, we make suggestions for further work.

Keywords—*Authentic Learning; Authentic Achievement; Authentic Assessment*

I. INTRODUCTION

The task of using assessment in a transformative way to promote deep learning is central to many influential modern educational theories, e.g. [1; 2]. However, a number of pedagogical approaches, such as problem-based, inquiry-based and project-based learning, require non-traditional methods of assessment in which students are examined on their performance in meaningful activities drawn from a professional context. In this setting, the concept of authenticity has emerged as a significant criterion for appraising the value of the assessment process itself. Viewed as a measure of the alignment of the educational aspects of a course of study with those of the professional environment into which the graduate subsequently emerges, it fits naturally into the network of ideas about student-centred pedagogies and has a solid conceptual base in philosophical and psychological discourse. Nevertheless, partly because the word does have such widespread currency in other areas of study, it is a concept which is open to varied interpretation, not least in an educational context where it may be used by both teachers and students with a range of meaning [3].

This paper seeks to investigate and classify the working definitions of authentic assessment expressed by academic staff within one university Computing department. We begin the paper by giving an overview of some of the ideas that contribute to the conceptual development of relevant aspects of authentic learning, which historically drew on the theory of educational goals proposed by Newmann et al. [4], as well as pedagogies such as situated and social learning theory. We give an overview of the concept of authenticity as applied to learning and pedagogy, before focussing on authenticity in the assessment process. Following a brief discussion of the meaning of authentic assessment, we describe two models, the

five-dimensional framework of Gulikers et al. [5] and the “thick” description of authenticity proposed by Shaffer and Resnick [6], which characterise authentic assessment and provide a good description of the range of meaning that underpins this concept.

We investigate faculty understanding of authentic assessment and analyse the variety of responses received from academic staff by comparing them with the criteria set out in the models described above. We give a brief comparison of faculty views with those expressed by students in an associated investigation. We discuss these findings in the context of increased institutional emphases on the development of graduate attributes and the enhancement of employability skills. This is usually accompanied by a desire to provide students with an “authentic” experience of employment by encouraging the acquisition of professional competences. We draw conclusions concerning the relevance of these factors on curriculum development, the use of assessment to drive learning, and the role of staff development in promoting positive change in these areas. Finally, we make some suggestions for further work.

II. AUTHENTICITY, ACHIEVEMENT AND ASSESSMENT

A. Assessment

An elaboration of the purpose, context and outcomes of assessment is one of the main elements of any applicable theory of educational development. An interesting etymological point can perhaps be made here: the word ‘assessment’ derives from the Latin verbal construction ‘*ad + sedere*’ - to sit down beside - and therefore appears to connote a model of appraisal which is closer to that of mentorship, providing guidance and feedback on the knowledge and skills that have been learnt.

This intimate link between assessment and student learning and performance not only forms the main idea behind the constructive alignment programme of Biggs [2] but also features as a central component in educational theories which developed from the work of Bandera [7] on self-efficacy. The focus adopted for the assessment process has a substantial impact on both the teaching and the realisation of intended learning outcomes [8]. Assessment tasks signal curricular priorities to students. Conversely, the assessment tasks need to take account of the context of learning as well as the operational details of the teaching process. This can be particularly challenging in modern educational settings, where both teacher and student are often compelled to direct their efforts to the satisfaction of assessment goals for non-academic, institutional reasons, regardless of whether these promote learning in the most effective way. A close alignment should therefore exist between teaching processes, learning goals, assessment procedures and learning and achievement [2].

B. Authenticity

The exploration of the concept of authenticity has a long history in philosophy and education. Splitter [9] cites it as “*one of those ‘central, common but contestable’ concepts which cry out for continual reflection and (re)examination*”, perhaps especially nowadays in light of what many report as an increasing experience of shallowness, post-truth fabrication,

and distortion in everyday life [10]. Philosophical and, later, psychological, interest in the concept is also strong, e.g. [11; 12; 13]. Taylor [14] summarises the ethical concerns of authenticity stating that “*this notion gives a new importance to being true to myself. If I am not, I miss the point of my life; I miss what being human is for me.*”

From a modern educational perspective, the exploration of the pedagogical implications of authenticity can be traced to the work of the pragmatic and constructivist philosopher John Dewey. In his early work, “*My Pedagogic Creed*”, e.g. in [15], Dewey outlines a correspondence view of educational authenticity that the context in which learning takes place should, as far as possible, resemble real life. Petraglia [16] notes Dewey’s emphasis on the student’s “lived experience” of the real world, and comments that “*[Dewey’s] lasting legacy is an abiding, almost unquestioned, sense of the need for learning in school to prepare one for the real world*”. However, it is not simply that the educational experience allows the child to apprehend the correspondence between the educational context and activity and the real world as a given. Rather there is an active engagement in the process of meaning-making, in which the learner tries to make sense of the correspondence between school and real-world activities, and hence construct meaning from the learning experience [9]. The development, therefore, of the important cognitive, metacognitive and interpersonal skills, competencies and dispositions required for this semiosis or “meaning-making”, is crucial for effective learning to take place.

A key concept of Dewey’s later educational work is that of learning through direct experience [17]. This view of experience is one of essential continuity. “*The principle of continuity of experience means that every experience takes up something which has gone before and modifies in some way the quality of those which come after*”. Hence, the learning experience constantly provides new ways of looking at things which, in turn, provides a new cognitive, behavioural and affective framework in which to situate subsequent experiences. Each experience necessarily involves an interaction with whatever constitutes the learning environment and teachers have a responsibility to work to create the conditions in which students’ purposeful action can result. This provides an interesting (and, as to be expected, pragmatic) description of knowledge in terms of warranted assertibility [18] as the outcome of inquiry, rather than the more traditional Platonist description of knowledge as justified true belief.

C. Authentic Pedagogy, Learning and Assessment

1) Authentic Pedagogy

The first specific use of the term authenticity within the context of learning and teaching appears to have been made by Archbald and Newmann in [19] and expanded in [20]. This was central to the later work of Newmann on Authentic Pedagogy, e.g. [21; 4; 22], which sought to ensure that the curriculum, teaching and assessment were all tied to real-world activities which connected to life beyond the classroom. Nevertheless, while he saw this link between educational activity and real-world tasks as necessary for authenticity, he did not view it as sufficient. In addition to the real-world correspondence, he also

suggested that a constructivist approach to learning and a proficiency in the normative process of enquiry within the discipline, which built on prior knowledge within the subject area in question, were also required. It is important to note that the constructivist enterprise in question is understood as an epistemological thesis about how human beings learn by psychological assimilation of experiences and understanding. This takes place through interaction with others, and is, fundamentally, a process by which learners make sense of their learning experience and is not the social constructionist thesis that knowledge, truth, texts, etc., are social constructs which have no reality independent of the learner.

A number of observations can be made about the concept of authenticity in this context, e.g. [9]. Firstly, there is a difference between the type of knowledge construction activities undertaken by students and the process of enquiry carried out by practitioners within the discipline itself. This notion of disciplined enquiry is closely linked to that of professional identity since the criteria of success for the activity are set by the community of practice and are rooted in the standards and norms of the body of successful practitioners. Consequently, students must master the tools and techniques of those practitioners in order to be recognised as reflective enquirers within the same disciplinary framework. The fact that it is possible to expound criteria for judging that what is being done in the classroom which is not simply based on the structural similarity between the academic problem and real-world activity means that authenticity cannot simply be reduced to the latter correspondence. Instead student work becomes more authentic when it resembles work outside the classroom but only insofar as the latter involves knowledge construction, disciplined inquiry, and other activities which make that work meaningful to those engaged in it. It follows, therefore that a real-world correspondence is an important criterion for authenticity but must be mediated by the activities of evaluation and meaning-making that are found in external situations. Pedagogical authenticity should therefore be grounded in the experience of learners, and viewed as part of the mechanism by which students acquire and master the cognitive, metacognitive, affective and social tools which underlie meaning and judgment, these things being understood as processes rather than just outcomes.

Secondly, the involvement of a community of professionals in determining the norms and standards of practice suggests a dialogical component to authenticity which provides an entry point into the discipline-based community. Consequently, there should be a focus on the development of skills that promote high level reflection [23], i.e. dialogic and critical reflection, in the framework developed by Hatton and Smith [24]

2) Authentic Achievement and Authentic Assessment

The approach of Newmann et al. to authenticity gave rise to a characterisation of what achievement in an authentic context looks like, the aim of which was to allow the learner to model and emulate the mastery level of proficiency demonstrated by successful practitioners. In this context, such a demonstration would include the production of knowledge instead of its reproduction or commentary. It should also demonstrate

disciplined enquiry, dependent on factors such as a prior knowledge base which is used to help to produce knowledge, an in-depth understanding rather than superficial awareness, and the ability to organise, synthesise and integrate information in new ways. In addition, there should be some aesthetic, utilitarian, or personal value to the assessment recognised by the student, over and above the attainment of a simple grade. Finally, the achievement should engage the kind of higher-order thinking and problem solving capacities used in a wider context, with the expectation that the achievement would be transferable beyond the immediate learning situation.

Application of the term “authentic” to assessment was made by Wiggins [25] who attempted to characterise the indicators of authenticity in the assessment process and produced a set of requirements concerning the nature of the activity, its context and the student response. In particular, his criteria for authenticity required activities that should:

- *be essential tasks that need to be done in the setting, and not needlessly intrusive*
- *be enabling, in that they guide students toward more sophisticated use of skills or knowledge*
- *entail the integration of skills and knowledge contextualised to the authentic setting in all its complexity, rather than being disaggregated to correspond to individual learning outcomes*
- *depend on the student's own research or use of knowledge*
- *emphasise higher order reasoning rather than simple recall or description*
- *be representative rather than comprehensive, giving students the opportunity to probe deeply rather than to gain broad but shallow experience*
- *be interesting and worthwhile, engaging students' interest and motivation revolve around complex, ambiguous or "wicked" problems (problems whose solutions create further problems). [25]*

Cumming and Maxwell [26] noted the semantic shift that occurred at this point. “Assessment of authentic achievement” places an emphasis on an appraisal of the authentic nature of the achievement or the learning, whereas ‘authentic assessment of achievement’ places an emphasis on the manner of assessment and could leave the nature of the achievement itself unexamined. They also identified four different interpretations of authentic achievement and assessment based upon the different teaching and learning approaches and different understandings of fundamental concepts such as the nature of knowledge and learning. These were achievement and assessment based on performance, situated learning and situated assessment, what they called “the complexity of expertise” which was assessed using problem-based assessment, and finally competence-based assessment.

a) Performance-based Learning

The dominant interpretation of authenticity identifies authentic achievement and authentic assessment with performance assessment, e.g. [27; 25]. Performance, here, is understood as the execution of some task or process which has

to be assessed through actual demonstration, what Wiggins called a productive activity. It also involves an emphasis on the integration of knowledge and assessment of learning objectives in a holistic fashion rather than focus on the individual component subtasks

b) Situated Learning

The concept of authenticity also emerged in work of Brown, Collins and others on situated knowledge and cognitive apprenticeships, e.g. [28; 29]. It was argued that the assimilation of useable, robust knowledge was facilitated by the use of approaches which embedded the learning activities in their appropriate social context [30; 31]. In order to successfully use the cognitive tools of a particular community of practice, the novice acquires the behaviour and values of the culture in which the community subsists. This is essentially an apprenticeship model in which the student is enculturated into the attitudes and practices of the community (the language, modes of communication, professional epistemology, problem-solving methodologies, disciplinary priorities, etc.) by progressive identification with its more skilful members. In this context, Collins [32] defined situated learning as “the notion of learning knowledge and skills in contexts that reflect the way the knowledge will be useful in real life”. This approach later found a central place in the work of Lave and Wenger on the social context of learning, e.g. [33; 34]. Situated assessment [35] is carried out within a situated context and its authenticity is dependent on the level to which they are embedded in a community of practice.

c) Problem-Based Learning

A third way of understanding authentic achievement and assessment is one that “recognises the complexity of expert performance which goes beyond technical facility” [26]. The degrees of complexity may be based on the ill-structured or open-ended nature of the problem and the need to employ a problem-solving approach which addresses the divergent nature of the task. The formulation of a solution typically requires a holistic approach which involves the completion and integration of many different subtasks and this generates a level of complexity which is unlike that found in more convergent problems. Since many demonstrations of mastery-level expertise within professional practice occur in just such situations, there is a link between this expression of authenticity and that described in the context of performance and situated learning. The characteristics of authenticity specified in the work of Newmann et al, i.e. production rather than reproduction, disciplined enquiry, and the construction of value and meaningfulness, are present. In addition, one feature of this type of authenticity is that it specifically focuses on higher-order critical thinking and problem solving skills. Situating authentic learning and a problem-based approaches therefore seem ideally suited as learning environments in which aspects of authenticity, including authentic achievement and authentic assessment, can be made explicit within the curriculum.

d) Competence-Based Assessment

Authentic assessment is also part of the appraisal of competences found in the context of vocational education and

training. In this situation, competence is equated with satisfactory performance, particularly in activities and skills drawn from the work sector. Because of its direct ties to the ‘real world’, competence-based performance is also seen as a construction involving authenticity, and hence competency-based assessment is judged to be a type of authentic assessment. The underlying philosophy is that vocational education should be focused on direct application to the workplace and hence should reflect, as closely as possible, performance of the skills in that the environment.

Competence itself could be demonstrated at different levels of complexity and may or may not require a holistic approach to the problem in order to satisfy the learning objectives. Authenticity of achievement comes from the alignment of the work with that of an expert or more experienced practitioner. Because of the nature of the situations in which competence-based assessment is used, it often involves real-world problems. Nevertheless, the performance and its subsequent assessment are usually staged within a controlled environment rather than being open-ended. It should be noted that the notion of competence used in this type of competence-based assessment is different from that used in, say, [36].

The work of Newmann and his collaborators set the scene and developed the underlying conceptual framework for later characterisations of authenticity which have, perhaps, been more widely cited in computer science and engineering literature. In particular, we mention the work of Shaffer and Resnick, and that of Gulikers and his collaborators.

Shaffer and Resnick [6] also argued for a nuanced approach to the application of the concept, suggesting that a learner’s perception of authenticity is essentially tied to an experience of consonance or harmony between different features of the learner experience. Students perceive authenticity in terms of an alignment between some important aspect of the learning process and some other element of the educational experience that they perceive to be meaningful.

They identified four distinct uses of the term which appears in educational contexts:

- A learning experience that was personally meaningful to the student,
- A “real-world” context outside the immediate classroom environment,
- Learning that provides an opportunity for students to “think in the modes of a particular discipline”,
- An operational view of authenticity in which the assessment process reflects the learning process.

Rather than focus on any individual element in this list. Shaffer and Resnick argued for what they called a “thick” view of authenticity which subsumed all these descriptions and recognised the “interdependent and mutually-supporting” nature of the concept.

The work of Gulikers et al. [37; 5; 38] produced a five dimensional framework which, rather than specifying the requirements on elements of authenticity within an assessment, instead described the situational factors that characterise the concept as more-or-less independent variables.

The situational factors they identified are:

- the task that defines the content of the assessment,
- the physical context in which students have to perform the assessment task,
- the social context, which tracks the degree of interaction that was possible during the assessment,
- the form or mode of assessment,
- the value criteria that constitute the measure of performance.

All of this work has contributed to the overarching framework in which the analysis of lecturers' views on authenticity took place. The need for a "thick" conception of authenticity, based on the underlying insights and terminology derived from the work of Newmann, Archbald and others informed the vocabulary used to characterise authenticity in this study.

III. METHOD

We wished to investigate concepts of authenticity in assessment described by academic staff working in an academic computing environment. Specifically, we wanted to see what teaching staff understood by the term and to compare this with the range of meaning that is found in the educational literature. A previous piece of work was conducted which looked at first year student perceptions of authentic assessment and it was therefore possible to compare the responses between the two groups and examine the similarities and differences between them.

A. The Participants

Our study used data obtained from a group of eleven members of the teaching staff employed in the School of Computing Science and Digital Media of the Robert Gordon University (RGU), Scotland, UK. RGU is a former polytechnic institution with a strong focus on professional and vocational education, which is reflected in high employment rates for graduates. The majority of its student cohort come to the university from the north east of Scotland, although there are a sizeable minority of overseas students, mostly from Eastern Europe.

The School itself has 25 full-time members of staff and teaches about 450 students on a number of undergraduate and postgraduate degrees in the subject areas of Computer Science and Software Engineering, Data Science, Information Security, Computer Network Management and Design, Computing for Graphics and Animation, and Digital Media. The respondents who took part in the study represented a cross-section of the lecturing staff and came from a range of academic backgrounds and teach on the full range of courses. The respondents also represented a cross-section of experience, ranging from one lecturer who had only been in his current role for three months to some who have over fifteen years of experience teaching in a higher education context. However, the mean length of time since taking up a first university teaching position was about five years. The majority of respondents would have undergone some form of teaching and learning certification awarded during a probationary employment period from the RGU central continuing professional development department, and

accredited by the UK Higher Education Academy. It should also be mentioned that the School has just gone through a period of academic review, which in Scotland is done by a process known as Institution-led Subject Review (ILSR). This process occurs every five years and looks at both quality assurance procedures and enhancement activities, and also serves as an opportunity to formulate a plan for the strategic direction of the School over the next review cycle. One outcome of this process was the adoption of proposals to implement wide-ranging curriculum changes which will see much greater use of a problem-based learning approach.

B. Experimental Method

Members of staff were invited to write a short paragraph (200 - 300 words) on what they understood by the phrase "Authentic Assessment". There was also some informal discussion of the paragraph content with the author. A qualitative content analysis approach [40] was employed to analyse the data received from 11 staff members. The method we used was made up of two procedures. The first was a combination of conventional (i.e., inductive, data-driven) and directed (i.e., theory-informed) content analysis (Section IV(A)), and the latter was an inductive analysis summarized as a holistic view of the data (Section IV(B)). These two procedures were initially conducted by different authors, after which the results and their correspondences were reviewed.

In the first procedure, the initial (inductive) step yielded 53 codes. Thirty-five of these were distinct and formed the data for the second round of directed content analysis in which the codes were grouped into larger thematic areas informed by the categories of the analysis outlined in section II. In the second procedure, data-driven (inductive) reviews of the information yielded main indicative points that were arranged into a view suggested by the data-analysis which suggested some integration between the indicative points while. When these two procedures were reviewed, correspondences were found between the 35 codes from the first procedure and the key points presented in the holistic view. In Figure 1, which displays the holistic view from the latter procedure, we include references to the initial codes from the first procedure; This illustrates discussions for shared understandings of the low-level codes, although different wordings were used by different authors performing the analyses.

IV. RESULTS AND DISCUSSION

A. Initial Analysis of Content Codes

The initial inductive content analysis from the 11 responses generated 53 codes, of which 35 were distinct. These were then aggregated into five broader themes based on the clustering of ideas around a central organising concept, informed by the various models described above. The sample size was small and so no attempt has been made to display any kind of frequency data associated with the staff responses. However, all of the respondents linked authenticity to real-world or graduate activities. In addition, the majority of lecturers also linked authenticity in the appraisal of skills with the opportunity for a practical demonstration of some kind.

TABLE I. LECTURER RESPONSE CODES AGGREGATED BY THEME

1	Aspects of Learning/ Cognitive Development	3	Content of Problem or Student Approach to Problem (continued)
1.1	Provides students with opportunities to demonstrate deep knowledge about a topic	3.6	Physicality of assessment set-up is important
1.2	Provides students with opportunities to display higher level cognitive skill, not reliant on memorisation or rote learning	3.7	Scaffolding needed
1.3	Allows measurability of effects of learning	3.8	Demonstrates link with professional competencies
1.4	Allows evaluation of the extent to which the learner is a reflective practitioner.	3.9	Demonstrates post-educational (i.e. graduate) skills.
1.5	Provides students with opportunities to display characteristics of mastery level expertise	4	Outcomes from the Assessment Activity
1.6	Favours (practical) skill over (rote) knowledge.	4.1	Allows innovation in method of solution
2	Context of the Assessment Problem	4.2	Provides safe environment for mistakes
2.1	Should allow collaborative working	4.3	Allows working outside comfort zone
2.2	Should be a Real World Problem	4.4	Provides trustworthiness of the validity of the results
2.3	Should be based on Workplace (real world) Learning	4.5	Provides sense of achievement
2.4	Allow students to contextualise their learning	4.6	Allows solution free of (extraneous) affective factors
2.5	Demonstrates link to future employability	5	Operational Aspects of Assessment
2.6	Involves (Academic) collaboration with, or led by, Industry		Allows practical demonstration of skills
3	Content of Problem or Student Approach to Problem	5.2	Involves creation of assessment artefact
3.1	Shows consonance or alignment with material presented in module.	5.3	Demonstrates Fairness in an applicable environment
3.2	Demonstrates Ill-defined/Open-endedness	5.4	Allows personalised, student-centred approach to assessment
3.3	Involves genuine production of knowledge	5.5	Problems with plagiarism
3.4	Should display or allow appreciation of complexity and unpredictability	5.6	Difficulties in mapping activities to LOs
3.5	Assesses suitability for entry into professional Community of Practice.	5.7	Allows access to readily-available information sources
		5.8	Allows for measurability of effects of learning

The first theme deals with cognitive aspects of learning and shows that faculty have a view authenticity in assessment that is partially directed to the display of higher order thinking skills such as reflection. The second theme on the context of the assessment is mainly concerned with the setting of the problem and clearly points to a performance-based element to the

concept. The real-world aspect of the assessment was highlighted as important by all members of staff and appears to be the primary characterisation of authenticity that they have assimilated. The third characteristic is Content and referred to the subject matter of the assessment. This, again was described as important, especially the alignment of what was assessed with the learning objectives set out in the course unit documentation. In addition, and linked to the real-world setting, is the idea that authenticity is due to the open-ended or ill-defined nature of the problem. The lack of convergence to a unique solution appears to be a strong factor and one particular code tracks the level of complexity and/or unpredictability of the assessment task. The fourth theme subsumes all the personal outcomes of the assessment for the student. These include the desire for innovative methods of solution, working in a safe environment which nevertheless allows for risk-taking and making mistakes. The last theme was based on operational aspects of the assessment such as the provision for practical demonstration of skills, for personalisation of the assessment process and fairness in the procedures used. It also included some negative aspects such as the need to ensure academic integrity.

These themes illustrate an understanding of the level of complexity that staff have when discussing this topic but it could be argued that the aggregations are still too theory-driven. Because of this, a second level of analysis was undertaken which focussed more on modelling staff understanding of the concept.

B. Second Analysis of Content Codes

While the combination of inductive and directed content analysis described above is useful and relatively straightforward to perform, it is, by its very nature, directed by theory and therefore presents a top-down approach to the data. In order to try to see if this method was too reductive, a second independent analysis was done, this time just using an inductive content analytic approach to abstract a more holistic view of interpreting the data. Figure 1 presents this holistic view extracted from this. This view is grounded in the degree of alignment between the course contents and the assessment procedures used on the course. The comments made by the respondents suggested that a baseline for authenticity was to have a strong match between the course contents and how students are assessed, which then makes the assessment fair. Furthermore, the respondents suggest that requiring the practical application of the skills and knowledge of students is possible when it is grounded in the module learning outcomes, while the application can also go beyond the course setting to increase correspondence with the real world. Alongside this increased use of application, authenticity is also increased (the left-hand side in the figure). The respondents clearly connect authenticity with real-world practice and the students' life after graduation. That is, authentic assessment means 'relevance' or 'meaningfulness' so that the assessment is useful to students with respect to their level of employability. The further the respondents go in their characterizations of authenticity, the more they emphasise uncontrolled work and the uncertainty therein. Along with highlighting the correspondence with real-

world problems, the respondents refer to increased opportunities for learning. Many respondents contrast good learning with rote learning, and note that, through authentic assessment activities, students notice the value of "process" in their learning effort. They also note that through the

introduction of collaborative problem solving, the learning of important soft skills can be promoted. In summary, staff appear to believe that the relevance or meaningfulness of authenticity seems to relate both to correspondence with real world and personally useful learning experience.

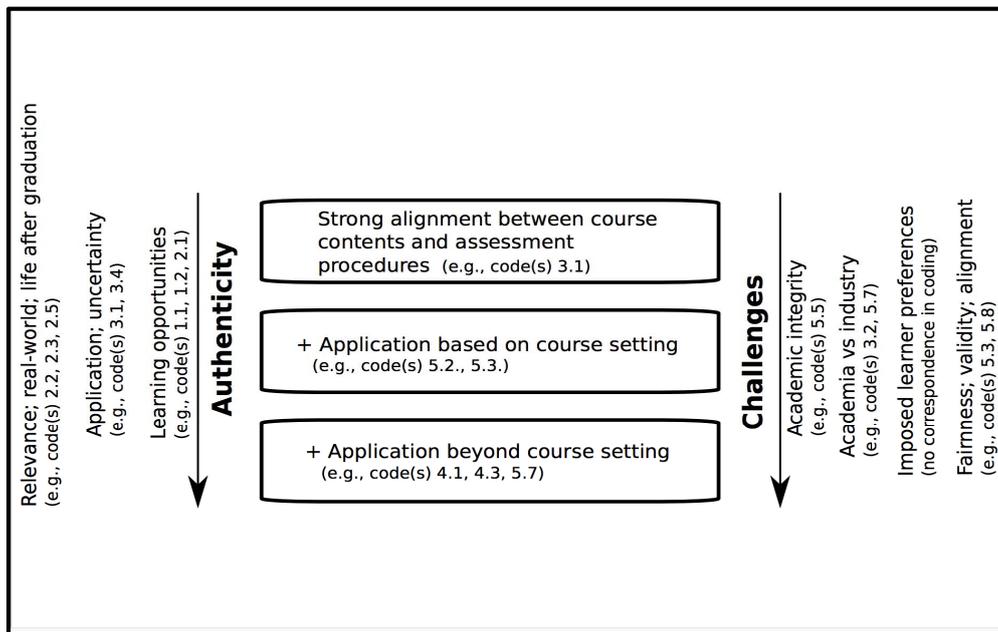


Fig. 1. Levels of Authenticity and Associated Challenges. (Numbers refer to the code numbering scheme established in Table 1 above)

The increased authenticity and application that extends over the course setting also entails challenges (the right-hand side in the figure). An important one from the lecturer perspective is, unsurprisingly, how to control authorship when assignments are done in an uncontrolled manner (i.e. academic integrity). The respondents also refer to timescales in two ways, which in our interpretation relates to the differences between academia and industry. On the one hand, allowing long timescales for assessed assignments would correspond to industry practice but would be difficult in an academic setting. On the other hand, strict deadlines and complicated tasks are better enabled in the industry setting; Students may not possess sufficient pre-knowledge for the tasks requiring application, and they would need extra study time to compensate for such an issue. Finally, the data suggests that staff evidently prefer a clear alignment between the course setting and assessment procedures. This implies that attention should be given to how to promote experiences of fair assessment when authenticity is increased. One obvious answer is to carefully communicate to students, for instance, that creative problem solving is valued as part of assessment.

Overall, the responses by the staff clearly harmonise with the two items of the thick view of authenticity [6]. First, the staff view signifies that students' learning experiences should be personally meaningful and, second, relate to the real-world. With some remarks, a third item – that the assessment process reflects the learning process – also holds. We note the challenge of fair assessment in terms of alignment between course

contents and assessment procedures in Figure 1. The fourth item, that students are allowed to think in the modes of the discipline, may be reflected in how the respondents referred to process instead of a product; perhaps the students' observations of the process and its importance during their authentic learning tasks promote disciplinary thinking.

C. Comparison with Student Perceptions of Authenticity

A related investigation into student perceptions of the concept of authenticity was reported in [39]. In that experiment, there were 78 student responses and hence some quantitative results on the relative frequencies of the individual codes could be found. Consequently, the percentage column in table 2 shows the relative frequencies of codes in the student responses. For example, 60% of the students mentioned a real-world context as an element of authentic assessment. We make some comparisons between the information obtained from the staff survey and that from the student survey and draw some brief conclusions. One preliminary observation is that it was found to be possible to classify both sets of data with the same major themes, namely the cognitive element of the assessment, the context of the assessment, the content of the assessment, operational aspects of the assessment and one theme which dealt with outcomes of the assessment.

The most obvious point arising from the tabular data given below is that the most frequent response was application to the real-world, mentioned by 60% of the students. This indicates that a significant proportion of the cohort do, in fact, agree that application to real world situations plays a significant role in the

identifying characteristics of authentic assessment. This is important since, as seen in section II, it has been a significant source for interest in the concept, as well as its continued development. It does, however, mean that 2 out of 5 students did not think that the real world application is naturally part of the definition of the concept. All staff respondents mentioned the importance of real-world context in their submissions, which may indicate a clearer understanding of the concept but would also reflect the fact that curricular changes were underway in the department which promoted a problem-based learning approach.

TABLE II. RELATIVE FREQUENCY OF CODES IN STUDENT RESPONSES (TAKEN FROM [39])

Code	%	Code	%
Cognitive Development		Form/Operational Aspects	
• Demonstrate Flexibility	3	• Presentation Style	1
• Depth of Understanding	6	• Clear Question	6
• Potential for Development	14	• Summative	5
• Opportunity for Reflection	4	• Personalised	5
• Problem-solving	17	• Not time-limited	3
• Critical Thinking	8	• Transparent (marking)	4
		• Focussed	1
Content in the Assessment		• Allows Choice	1
• (Appropriately) Challenging	42	• Novel/Original (Questions)	13
• Fairness	28	• Attributable	12
• Multifaceted/ Graduated	3		
• Relevant	15	Outcomes	
• Not just memorisation	8	• Motivating/ Engaged	6
• Open-ended	4	• Satisfying/Sense of Accomplishment	1
• Creativity	10	• Confidence-building	1
• Discriminating	1	• Allow best work	4
• Comprehensive	17		
		Total Number of Codes = 253	
Context of the Assessment		Total Number of Students = 78	
• Knowledge used in future	17		
• Application to Real-World	60		
• Collaborative	1		
• Scenario-based	3		

An interesting feature of the two sets of data is that the second most common student response – that the assessment should have the appropriate level of challenge – was not explicitly mentioned in the staff responses, although there were a number of responses which could conceivably form part of this concept, including the very common staff response about the need for the assessment to show proper alignment with the course material. This perhaps has some correspondence with the thick authenticity classification of Shaffer and Resnick since it could be considered an example of an assessment which

is personally meaningful. However, a notable omission from the codes for the students is any explicit reference to Shaffer and Resnick's third type of authenticity, which relates to learning that provides an opportunity for students to “*think in the modes of a particular discipline*”. While there are staff codes which deal with evaluation of the extent to which the learner is a reflective practitioner, providing the opportunity for students to give a practical demonstration of skills, and allowing for the exhibition of mastery-level abilities, there is also no explicit mention of this element in staff responses. This may give some cause for concern as this kind of induction into the community of practice of the professional practitioner is generally considered an important component of authenticity.

V. CONCLUSION

The aim of this paper was to highlight the basic principles behind the introduction of the concept of authenticity into discussions of teaching, learning and assessment, to examine whether staff working in a School of Computing Science and Digital Media in the United Kingdom, consider it to be important, and identify how they conceptualise it. The immediate practical reason for this was an attempt to understand whether this was a significant motivating factor in the process of curriculum development. While it is conceded that this is quite a particular focus for such an investigation, we believe that the issues raised when considering the question are also those faced by almost all departments wishing to increase engagement with problem-based learning approaches.

It is clear from the tabulated results that, taken together, the members of academic staff have a reasonably nuanced view of what authenticity connotes, with a wide spectrum of meaning reported. While the sample size was small, the range of concepts appeared to be aligned with those articulated by the students and those found in the literature, e.g. Shaffer and Resnick thick conception of authenticity. This is important since the ability to gauge authentic achievement in an approach like problem-based learning is central to its pedagogical approach, and hence is a prerequisite for any curriculum and course development in this area. Embedding authenticity through the use of real-world projects seems to be considered of primary importance when considering curricular enhancement activities by staff. This view also seems to be held by students, with the link between practical demonstrations of skills and improving employability featuring highly in both staff and student responses.

We close by remarking that there appears to be further work needed to highlight the induction aspects of this type of assessment, and that, in some ways, these may be more important than the real-world context that seems to be the current focus of attention. We would point out that authenticity is, by its nature, a relational concept, in this case one that relates the achievement of the student to that of an expert practitioner in the field. Students should therefore be made aware of the gate-keeping functions of entities such as professional bodies, and the role that they play in determining whether the achievement of the learner is authentic, in the context of professional practice.

REFERENCES

- [1] Boud, D., 1995. Assessment and learning: contradictory or complementary. In P. Knight (Ed.) *Assessment for learning in higher education*, pp.35-48, London: Kogan.
- [2] Biggs, J.B. (2003). *Teaching for quality learning at university*. Buckingham: Open University Press.
- [3] Entwistle, N., 2003. Promoting deep learning through teaching and assessment: conceptual frameworks and educational contexts.
- [4] Newmann, F.M., 1996. *Authentic achievement: Restructuring schools for intellectual quality*. Jossey-Bass.
- [5] Gulikers, J., Bastiaens, T. and Kirschner, P., 2006. Authentic assessment, student and teacher perceptions: the practical value of the five-dimensional framework. *Journal of Vocational Education and Training*, 58(3), pp.337-357
- [6] Shaffer, D.W. and Resnick, M., 1999. "Thick" Authenticity: New Media and Authentic Learning. *Journal of interactive learning research*, 10(2), p.195.
- [7] Bandura, A., 1977. Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84(2), p.191.
- [8] Brown, G.A., Bull, J. and Pendlebury, M., 2013. *Assessing student learning in higher education*. Routledge.
- [9] Splitter, L.J., 2009. Authenticity and constructivism in education. *Studies in philosophy and education*, 28(2), pp.135-151.
- [10] Allcott, H. and Gentzkow, M., 2017. Social media and fake news in the 2016 election (No. w23089). National Bureau of Economic Research.
- [11] Wrathall, M.A. and Malpas, J.E. eds., 2000. *Heidegger, authenticity, and modernity* (Vol. 1). MIT press.
- [12] Guignon, C.B., 2004. *On being authentic*. Psychology Press.
- [13] Snyder, C.R. and Lopez, S.J., 2009. *Oxford handbook of positive psychology*. Oxford University Press, USA.
- [14] Taylor, C., 1991. *The Ethics of Authenticity*, Cambridge, Massachusetts and London.
- [15] Dewey, J., 1897. My Pedagogic Creed. pp.17-23. in Flinders, D.J. and Thornton, S.J., 2004. *The curriculum studies reader*. Psychology Press
- [16] Petraglia, J., 1998. *Reality by design: The rhetoric and technology of authenticity in education*. Routledge.
- [17] Dewey, J. 1938. *Experience and education*. New York: Macmillan
- [18] Dewey, J. 1938. *Logic: The Theory of Inquiry*, Henry Holt and Company, New York, NY, 1938. Reprinted, pp. 1–527 in John Dewey, *The Later Works, 1925–1953, Volume 12: 1938*, Jo Ann Boydston (ed.), Kathleen Poulos (text. ed.), Ernest Nagel (intro.), Southern Illinois University Press, Carbondale and Edwardsville, IL, 1986.
- [19] Archbald, D.A. and Newmann, F.M., 1988. *Beyond Standardized Testing: Assessing Authentic Academic Achievement in the Secondary School*.
- [20] Newmann, F.M. and Archbald, D.A., 1992. The nature of authentic academic achievement. *Toward a new science of educational testing and assessment*, pp.71-83
- [21] Newmann, F.M., Marks, H.M. and Gamoran, A., 1995. *Authentic pedagogy: Standards that boost student performance. Issues in Restructuring Schools* (Issue Report No. 8). Madison, WI: Center on Reorganization and Restructuring of Schools. Retrieved May 23, 2008.
- [22] Newmann, F.M., Bryk, A.S. and Nagaoka, J.K., 2001. *Authentic Intellectual Work and Standardized Tests: Conflict or Coexistence? Improving Chicago's Schools*.
- [23] Splitter, L.J., 2007. Do the groups to which I belong make me me? Reflections on community and identity. *School Field*, 5(3), pp.261-280.
- [24] Hatton, N. and Smith, D., 1995. Reflection in teacher education: Towards definition and implementation. *Teaching and teacher education*, 11(1), pp.33-49.
- [25] Wiggins, G.P., 1993. *Assessing student performance: teaching computer science: An activity-based approach. Exploring the purpose and limits of testing*. Jossey-Bass.
- [26] Cumming, J.J. and Maxwell, G.S., 1999. Contextualising authentic assessment. *Assessment in education: Principles, policy & practice*, 6(2), pp.177-194.
- [27] Torrance, H., 1995. *Evaluating authentic assessment: Problems and possibilities in new approaches to assessment*. Open University.
- [28] Brown, J.S., Collins, A. and Duguid, P., 1989. Situated cognition and the culture of learning. *Educational researcher*, 18(1), pp.32-42.
- [29] Collins, A., Brown, J.S. and Newman, S.E., 1988. Cognitive apprenticeship: Teaching the craft of reading, writing and mathematics. *Thinking: The Journal of Philosophy for Children*, 8(1), pp.2-10.
- [30] Honebein, P.C., Duffy, T.M. and Fishman, B.J., 1993. Constructivism and the design of learning environments: Context and authentic activities for learning. In *Designing environments for constructive learning* (pp. 87-108). Springer Berlin Heidelberg.
- [31] McLellan, H., 1996. Situated learning: Multiple perspectives. *Situated learning perspectives*. Educational Technology.
- [32] Collins, A., 1988. *Cognitive apprenticeship and instructional technology* (Technical Report No. 6899): BBN Labs Inc., Cambridge, MA.
- [33] Lave, J., 1988. *The culture of acquisition and the practice of understanding*. Palo Alto, CA: Insititute for Research on Learning (No. 88-0007). Tech. Rep.
- [34] Lave, J. and Wenger, E., 1991. *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press.
- [35] Rømer, T.A., 2002. Situated learning and assessment. *Assessment & Evaluation in Higher Education*, 27(3), pp.233-241.
- [36] Daniels, M., Cajander, Å., Pears, A. and Clear, T., 2010. Engineering education research in practice: Evolving use of open ended group projects as a pedagogical strategy for developing skills in global collaboration. *International journal of engineering education*, 26(4), pp.795-806.
- [37] Gulikers, J.T., Bastiaens, T.J. and Kirschner, P.A., 2004. A five-dimensional framework for authentic assessment. *Educational technology research and development*, 52(3), pp.67-86.
- [38] Gulikers, J.T., Bastiaens, T.J., Kirschner, P.A. and Kester, L., 2008. Authenticity is in the eye of the beholder: student and teacher perceptions of assessment authenticity. *Journal of Vocational Education and Training*, 60(4), pp.401-412.
- [39] McDermott, R., Zarb, M., Daniels, M. and Isomöttönen, V., 2017, June. First Year Computing Students' Perceptions of Authenticity in Assessment. In *Proceedings of the 2017 ACM Conference on Innovation and Technology in Computer Science Education* (pp. 10-15). ACM.
- [40] Hsieh, H.F. and Shannon, S.E., 2005. Three approaches to qualitative content analysis. *Qualitative health research*, 15(9), pp.1277-1288.
- [41] Heikkinen, J. and Isomöttönen, V., 2015. Learning mechanisms in multidisciplinary teamwork with real customers and open-ended problems. *European Journal of Engineering Education*, 40(6), pp.653-670.