

DOES THE QUALITY AND QUANTITY OF EXAM REVISION IMPACT ON STUDENT SATISFACTION AND PERFORMANCE IN THE EXAM ITSELF?: PERSPECTIVES FROM UNDERGRADUATE DISTANCE LEARNERS

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Abstract

This paper reports the findings of a large-scale survey in to the student experience of assessment at the UK's largest distance learning university. Three key aspects of assessment were covered in the survey: formative assessment, revision for examination and the examination/end of module; with a view of providing insight for more effective learning designers and learning analytics. This analysis meets an urgent need to better understand the assessment analytics associated with the 'revision' period – the weeks leading up to an examination that may be crucial in ensuring student assessment success, building confidence, and improving progression to the next course. Using results from an online questionnaire (n=281) sent to undergraduate distance learners and follow-up telephone interviews (n=13), this paper will examine some of the relationships between the revision and examination experience. Specific regard will be paid to usefulness of revision resources, time spent revising, enjoyment, reflection and learning, exam preparedness and clarity, mark satisfaction and score received. The paper will begin with an overview of the central findings of the survey, followed by a focus on the relationship between the 'revision' period and the examination itself. In particular, aspects of student experience, performance and self-reported learning effort will be explored. The research represents an important step in extending the scope of assessment analytics and in better understanding the opportunities for providing more timely, targeted or personalised learning support. Key findings of the analysis reported are that revising for an exam and the exam itself are relatively distinct experiences; there is no significant correlation between time spent revising, usefulness of revision resources and module exam score. Similarly, revision for learning, revision design and satisfaction with revision resources appear as distinct factors in the student experience. These results have clear implications for the design and teaching of assessment.

Keywords: Learning Analytics, Student Experience, Examinations, Revision, Assessment Analytics, Learning Design, Student Survey, Higher Education, Distance Learning.

1 INTRODUCTION

End of module examinations represent a crucial experience for the learner, teacher and institution. Students want to receive a good mark and feel that they have been given a fair opportunity to demonstrate their learning, whilst teachers want to ensure students pass and progress to their next module. Immediately prior to an examination, most courses offer students a period to 'revise' and prepare for the examination. The focus of this paper is the relationship between these two events: the period of revision and the exam itself.

In particular, the paper examines whether behavioural and affective indicators of learning - hereafter termed 'revision analytics' - relate to how students feel about their assessment experience, including how well the exam went and how well they performed. This intentionally expands the scope of assessment analytics from an emphasis on student attainment and achievement [1] to include the period of learning that falls 'after' the module ends. Exam revision should be conceived of as a period of learning, albeit one that is often quite differently structured from the main teaching of the module. Therefore, questions about the quality and quantity of the revision design, revision resources, guidance, and teacher support become particularly pertinent.

The need to better understand the student exam experience was flagged almost a decade ago in a report by the Quality Assurance Agency for Higher Education [2]. This found that the measurement of the student experiences of exams and the relationship between exams and the other assessment used is often overlooked. In particular the report noted that ‘what does seem puzzling – and was confirmed in our interviews with students – is why students’ perceptions of exams should be so rarely inquired into’ [2]. Indeed, questions about the revision and examination experience are largely absent from national student surveys such as the Experiences of Teaching and Learning Questionnaire, Course Experiences Questionnaire, UK National Student Survey Questionnaire [3], [4], [5] and assessment-specific questionnaires [6]. These questionnaires tend to mainly focus on the relationship between assessment, learning and learning outcomes, the quality of the formative assessment including quality and timeliness of feedback, the communication of assessment criteria and expectations, and the blend of methods used.

Previous research on exam revision has explored the use of specific technologies or learning activities in revision, ranging from the use of electronic surveys [7], mobile tools [8], practice tests [9], understanding marking criteria [10], the reuse of materials encountered earlier in a module, podcast revision lecturer [11], and examination strategies [12]. More directly related to learning analytics, student use of resources such as videos, lecture slides and wiki articles for exam preparation has been investigated [13] as has VLE data to understand online revision activities of a small group of students [14]. Papamitsiou & Economides also touch upon exam revision, noting in their conclusion that goal-

on this assumption, goal-expectancy affects how students perform in their assessment. They also discuss the prospect of measuring satisfaction with perceived achievement and conclude these relations would be interesting to explore further [15], [16].

These studies demonstrate growing interest in revision and the examination but there remains a need to better understand how the two activities – the revision and the exam – work together and the relationship between them. What behavioural or affective indicators could help teachers better support students revising or help students make better choices as to how to approach their revision. As the title of this paper asks: how does the quality and quantity of exam revision impact on student satisfaction and performance in the exam itself?

2 METHODOLOGY

2.1 The Student Experience of Feedback, Assessment and Revision Survey (SEFAR)

Data was collected using the SEFAR student questionnaire, an online survey developed by the research team with reference to prior external and internal research and in consultation with assessment experts at the university. The SEFAR survey included 20 questions that together probed four key elements of the student assessment journey: the formative and summative aspects of module assignments (at The Open University these are termed Tutor Marked Assessments or TMAs), exam revision, and either the examinations or the equivalent project or coursework assignment.

The questionnaire was sent to 2,500 undergraduate students in spring 2015. Half of this group was selected at random from the undergraduate body. However, in order to ensure that the survey properly included the full range of assessment strategies and teaching approaches used within the university, the other half of the sample was selected at random from ten hand-selected modules. These ten modules represented the full range of assessment designs and their selection was made by the research team based on a review of over forty module learning designs and VLE activity reports.

Participants were asked to give their responses in respect to the last module they completed and not their current module. This was necessary so as to learn about the entire student experience including the examination and helped resolve one of the challenges in surveying student experience [4]. However, this method did rely on students’ recollection of events that took place between six to nine months earlier. The response rate of the survey was 13%.

The university's survey group independently administered the survey by sending a personally addressed email to each student. The survey was open for approximately four weeks and a reminder email was sent mid-way. Prior to passing an anonymised dataset on to the research team, key socio-demographic information and the final module mark (where available) were added to the dataset.

2.2 Survey questions

Four of the SEFAR questions specifically asked about revision and the examination. Participant responses to these comprise the core dataset used in this paper.

The first question comprised six measures of revision experience (Table 1). These were determined based on the review of assessment questionnaires (as outlined above), relevant element of assessment benchmarks [17] and consultation with staff involved with the university's Assessment Programme. Participants were asked the extent they agreed or disagreed with a statement relating to each measure. A standard five-point Likert scale with the following labels was used: strongly agree, agree, neither agree nor disagree, disagree and strongly disagree.

Table 1. Revision experience measures

Measure	Survey question
Revision Clarity (RC)	I was clear about what and how I should revise
Reflection (Rf)	Revising helped me reflect and consolidate what I had learnt earlier in the module
New Learning (NL)	I learnt new things when revising
Revision enjoyment (RE)	I enjoyed revising the module materials
Revision support (RS)	I was given adequate revision support and guidance
Time allocation (TA)	There was enough time allocated in the module schedule for revision

The second question asked participants how long they spent revising.

The third question asked how useful nine revision resources had been. The list of resources was selected by reviewing the types of revision resources used in thirty four modules (including the ten included in the sample) and also made reference to those previous studies mentioned earlier. Response options comprised a scale of usefulness and included six options: very useful, useful, somewhat useful, not useful, not used, and not applicable/not sure. This scale provides additional granularity over simply asking whether a resource was used or not. The last option was included because some modules may not have offered some of the revision resource types.

The nine resources included in the survey were:

- Sample exam and worked answers (SE)
- Peer support via online forums (OF)
- Revision skills website (RW)
- Tutor support and advice (TS)
- Assignment feedback (AF) received from tutors during the module
- Timed practice exam (TPE)
- Online revision sessions (ORS)
- Practice computer marked quizzes (CMQ)
- Purchased additional sample exam papers (AEP)

The fourth and final question comprised six measures of the examination experience. These are shown in Table 2. As for the first question (above), students were asked to agree or disagree with each statement.

Table 2. Exam experience measures

Measure	Survey question
Exam Preparedness (EP)	On the day of the exam I felt well prepared
Question Clarity (QC)	The exam questions were clear and well written

Opportunity Satisfaction (OS)	I felt able to demonstrate what I have learnt (the exam questions were fair)
Exam difficulty (ED)	The exam was harder than I was expecting
Exam enjoyment (EE)	I enjoyed sitting the exam
Mark Satisfaction (MS)	I was satisfied with the mark I got

In addition, where available, the student's final mark (a percentage) for the module was added to the survey response. Most often the examination mark comprised at least 50% of this final mark, thus indicating a fair representation of student exam performance.

2.3 Participants

Of those who participated in the SEFAR survey, 118 had taken a module ending in an examination and were therefore eligible for inclusion in the analysis presented in this paper. The proportion of men and women in this group was similar to that of the university overall and there were a similar number of responses across age groups (Table 3). Thus, the participants are a good representative sample of the larger university population. The Cronbach alpha of the four survey questions (see 2.2) used in the analysis is .808 (n=118), which indicates good internal consistency.

Table 3. Age of respondents

Age group	Number of responses
Under 25 years old	12 (10%)
25-34 years old	32 (27%)
35-44 years old	25 (21%)
45-54 years old	29 (24%)
55 and over	20 (17%)

2.4 Analysis

Analysis and sorting of the data by the team was undertaken using the current version of SPSS. Correlations between data were analysed using the Pearson product-moment correlation. For the purposes of this analysis a moderate correlation is shown by an r value between .300 and .500, and a strong correlation by an r value greater than .500. A p value of 0.01 or less was used to determine if a result was statistically significant.

3 RESULTS

3.1 Time spent revising and revision resources used

Most students spent 20 hours or more revising (Table 4) with the most popular time being between 20-30 hours. Where students selected the more than 30 hours option, they were asked to state how much longer they had spent. These comments indicated that the majority of students in this category spent between 30 and 50 hours revising.

Table 4. Time Spent Revising (TSR)

Time	% of students
0 hours	0%
Up to 10 hours	3.4%
10-20 hours	14.4%
20-30 hours	43.2%
More than 30 hours	39.0%

Table 5 shows the how useful the respondents found five of the nine revision resources. The other four revision resources were not universally provided by every module making it harder to calculate the average. The table shows that Sample Exams/answers (SE), tutor support (TS) and assignment

feedback (AF) were found to be particularly useful whilst half the respondents failed to use the revision skills webpages (RW).

Table 5. Use and usefulness of revision resources

	Useful or very useful	Somewhat or not useful	Did not use
Sample exam and answers (SE)	83.9%	11.0%	5.1%
Revision skills webpages (RW)	26.3%	26.3%	47.5%
Tutor support and advice (TS)	58.5%	19.5%	22.0%
Online Forums (OF)	31.4%	33.9%	34.7%
Feedback from assignments (AF)	55.9%	29.7%	14.4%

In order to explore the association between resource use, time spent revising and overall module score, two new variables had to be created: the total 'number of revision resources used' was calculated by counting the number of resources students had said they had found very useful, useful, somewhat useful and not useful (i.e. it is assumed that a student had to have used a resource so as to determine whether it was useful or not useful); and the total 'number of resources available' was calculated by adding the number of revision resources used to the number the students had 'not used' (i.e. it is assumed that if a student answered 'not used' then the resource was available but not used).

Of course, not all modules provided students with all nine revision resources so a 'percentage of available resources used' was calculated. This was done by dividing the 'number of revision resources used' by the 'number of resources available'. Pearson's correlation found no significant correlation between the percentage of available resources used and time spent revising ($r=.069$, $p=.456$, $n=118$) or between the percentage of resources used and the overall module score ($r=.006$, $p=.957$, $n=78$).

3.2 Comparing the revision and examination experience

Students had very different experiences of their revision and examination. Table 6 shows how students responded to the six statements about their examination experience.

Table 6. Student views on examination experience

	Strongly agree or agree	Neither agree nor disagree	Strongly disagree or disagree
On the day of the exam I felt well prepared (EP)	69.5%	23.7%	6.8%
The exam questions were clear and well written (EC)	87.3%	6.8%	5.9%
I felt able to demonstrate what I have learnt (OS)	72.9%	13.6%	13.6%
The exam was harder than I was expecting (ED)	29.7%	43.2%	27.1%
I enjoyed sitting the exam (EE)	24.6%	27.1%	48.3%
I was satisfied with the mark I got (MS)	62.7%	14.4%	22.9%

Responses for strongly agree and agree, and for strongly disagree and disagree, were combined so as to make the table easier to read. Across the five options there was a good distribution of responses. Whilst a majority felt well prepared on the day of the exam (69.5%) and felt the exam gave them sufficient

opportunity to demonstrate what they had learnt (72.9%), there was still a sizable minority of students who did not agree.

Analysis of the student experience of revision and examination began by investigating which measures of the revision experience correlated with one or more measures of examination experience. Each pair of items was analysed and Fig. 1 shows all significant correlations where $r > .300$.

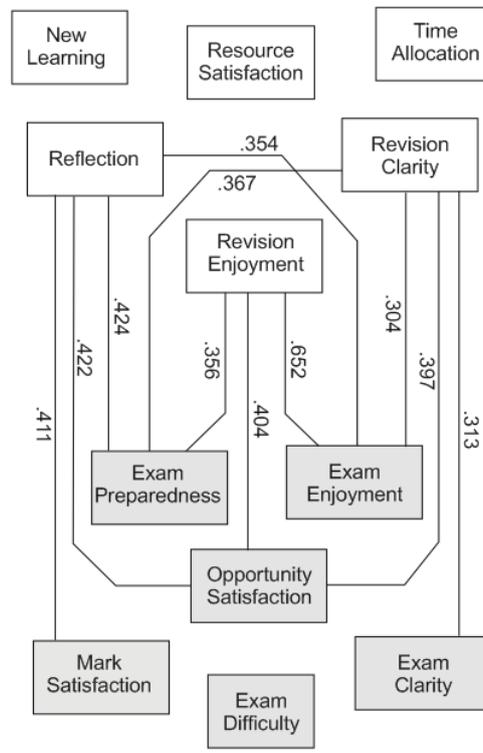


Figure 1. Diagram showing significant correlations ($p < .01$) between the revision and exam experience where $r > .300$

The correlation analysis showed there to be moderate correlations between revision clarity and four aspects of the examination experience: exam preparedness, exam clarity, opportunity satisfaction and exam enjoyment. There were also correlations between reflection during revision and exam preparedness, mark satisfaction, opportunity satisfaction and exam enjoyment. Revision enjoyment was strongly correlated with exam enjoyment and also moderately correlated with exam preparedness and opportunity satisfaction. This analysis shows that there are specific aspects of the revision experience that demonstrate a significant relationship with aspects of the exam experience.

Analysis was also undertaken to determine if any of the variables correlated with time spent revising and Overall Module Score. No significant correlations were found between Time Spent Revising and any of the twelve variables shown in Fig.1. Overall module score was moderately correlated with Exam Preparedness ($r = .429$, $p = .000$, $n = 78$), Opportunity Satisfaction ($r = .345$, $p = .002$, $n = 78$), Mark Satisfaction ($r = .355$, $p = .001$, $n = 78$) and was inversely correlated with Exam Difficulty ($r = -.418$, $p = .000$, $n = 78$).

An exploratory factor analysis was next performed on the dataset in order to further investigate the structure in the relationships between variables and determine how revision resources loaded against the factors. The dataset comprised the six items relating to the revision experience, the 6 relating to the examination experience and 5 items relating to usefulness of specific revision resources. Only revision resources that had been made available to all respondent were included. Overall exam score was excluded because the focus was on the experience of revision, and Time Spent Revising was excluded because this had already been found not to correlate with the other variables. Varimax orthogonal rotation identified five factors with Eigenvalues greater than 1 (Table 7). Given there was no preconceived pattern, all factors with an Eigenvalue greater than 1 were retained. The threshold of

significance for factor loading for a sample of this size was considered to be 0.5 although for the purposes of this investigation Table 7 shows all loadings greater than the slightly lower threshold of 0.4.

Table 7. Rotated Component Matrix showing five factors

	Component				
	1 EExp	2 SRR	3 LfR	4 RDgn	5 QLit
ED	-.798				
MS	.747				
OS	.741				
EP	.600				
EE	.589		.448		
EC	.502				.498
OF		.827			
AF		.683			
RW		.614			
TS		.580		.477	
RS		.469	.412	.459	
NL			.845		
RE			.699		
Rf			.610		
TA				.777	
RC				.607	
SE					.816

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 7 iterations.

Together these five factors explained 63.7% of the variance. Bartlett's Test of Sphericity was significant ($p < .001$) indicating that the matrix was not an identity matrix. Commonalities for all but one variable were above .5 (ranged from .545 to .797); the exception being Usefulness of Website (.420). This latter variable was, however, retained because this was broadly an exploratory analysis. Convergent validity and discriminant validity were generally satisfactory although one variable exhibited cross-loading across three factors and for two variables the difference in loading between factors was less than 0.2 (but greater than 0.1). Face validity and reliability tests were satisfactory. Together this indicates good confidence in the results.

The following descriptions of each factor were created after reviewing which items loaded on to which factor. The five factors identified are:

- Exam Experience (EExp) (Factor 1). Survey questions about feeling prepared for the exam, feeling able to demonstrate learning, being satisfied with mark, not finding the exam harder than expected and enjoying the exam all load to this factor.
- Satisfaction with Revision Resources (SRR) (Factor 2). Loading on this factor are satisfaction with revision support and guidance, and the usefulness of four revision resources (forum, tutor advise, revision website and feedback from module assignments).
- Learning from Revision (LfR) (Factor 3). Variables concerning New Learning and Reflection – the two variables most closely associated with student learning – and Enjoyment of Revision all strongly on to this factor. In addition, perhaps worthy of note, Exam Enjoyment cross-loads on to the variable.

- Revision Design (RDgn) (Factor 4). This is loaded with variables concerning students feeling they were given satisfactory time to revise, clarity of revision instructions, usefulness of tutor advice, and satisfaction with the revision support.
- Question Literacy (QLit) (Factor 5). The fifth factor loads with the only other revision resource – Sample Examinations –along with Question Clarity. These loading suggest that this fifth factor may be about question literacy; that is to say, how familiar, experienced and aware students are of the question types and structures used in the examination because they have practiced using the sample examinations.

4 DISCUSSION

Five dimensions to the revision and examination experience were identified in the analysis: Exam Experience, Satisfaction with Revision Resources, Learning from Revision, Revision Design and Question Literacy. These results indicate there may be different dimensions to revision as students reflect back on their learning, undertake new learning, and prepare for their examination. Factor analysis places the experience of the examination in a different dimension to those associated with revision, which would indicate the two are distinct experiences and that student satisfaction with each may rest on different underlying variables.

Based on previous studies of student engagement [3], it had been expected that indicators of engagement in revision, such as the percentage of revision resources used and the usefulness of particular revision resources, would show positive correlations with satisfaction of the revision or examination experience (the assumption being that if resources were found to be useful student would use them during their revision), enjoyment and exam performance. And that this, in turn, would indicate potential items that analytics could monitor and use these as indicators of the learning experience and satisfaction with it. However, analysis showed that four of the five resources loaded on to a separate factor (Satisfaction with Revision Resources) and that, for these, there was little by way of correlations between revision resources and revision or exam satisfaction. Furthermore, time spent working was not correlated to perceptions of the experience or overall module score and the proportion of available revision resources used was not significantly correlated with overall module score.

There were, however, two particularly noteworthy results in respect to resource use. Firstly, that use(fulness) of sample exam papers comprised a separate factor that was also loaded by the variable relating to clarity of the exam question. This would suggest that students who use and include sample exams in their revision may develop a better question literacy and, therefore, find the questions they encounter in the examination clearer and easier to understand. Within the sample used for this study, 5.1% did not use sample exams and a further 11.0% found them only somewhat or not useful. One potential flag for at-risk students, therefore, may be the lack of engagement with previous sample examinations. This finding will be of particular interest in developing assessment literacies and development of student interventions (such as [18]).

The second notable result in respect to analytics is that tutor support and advice loaded onto the same factor as other variables associated with satisfaction with the revision design. Again, this would suggest that those not using or taking tutor advice may have lower perceptions of the quality of revision design. A further finding was that enjoyment and new learning loaded on to the same dimension and that revision enjoyment was correlated to exam enjoyment. It is significant that enjoyment emerges as a separate factor and, moreover, it is this factor that includes broad pedagogic measures associated with student reflection and new learning during revision.

Investigation into the relationship between module score and satisfaction has been identified as an area for further study [15] and the findings reported above show correlations between performance and several aspects of the examination experience: exam preparedness, satisfaction with mark, feeling the exam offered sufficient opportunity to demonstrate learning and (inversely) exam difficulty. However, student performance as measured by module score was not correlated with measures of the revision experience, revision resources, nor with exam enjoyment. This demonstrates that performance should not be the only dimension considered when monitoring the student experience of revision and that use

of many revision resources alone may not give a good indication of examination performance or satisfaction.

Although the analysis is based on responses from 118 distance learners there is no reason to believe particular bias in the sample: there was a similar number of men and women and representation from all age groups. Also, the response rate for the SEFAR survey was 13%. This may seem low but is not considered substantially below expectations for this type of online institutional survey, especially as it was asking about the student's previous module. Two further limitations are that only five revision resources were included in the factor analysis (a further four being excluded from the analysis because they were not offered universally across university modules) and that respondents were distance learner who may display different behaviours to those studying at face-to-face institutions.

5 CONCLUSION

This paper has examined the relationship between revision experience, revision activity, examination experience, and module performance. Responses from 118 distance learners in respect to six measures of the revision experience, six measures of the examination experience and satisfaction with five revision resources has provided valuable insights.

A key finding is that indicators such as the usefulness of specific revision resources, the proportion of revision resources used, and a measure of time spent revising do not appear to give a satisfactory indication of the examination or revision experience, exam preparedness or overall module score. To an extent this would be expected [19] yet it serves to demonstrate that revision and examination represents a distinct phase of learning and that there remains a challenge to determining effective analytics it [16].

More encouraging were indications that use of specific revision resources could contribute positively to student learning and examination skills acquisition. In particular the analysis suggests that the use of sample papers for exam practice may improve exam question literacy and that the lack of use could be a useful analytic. This is supported by other recent work associated with assessment literacy [10] and whilst this study was unable to examine the role of revision quizzes, practice timed assessments or live online revision sessions, these, along with deeper analysis of student engagement in those revision resources it did include, present clear opportunities for further research.

A second key finding is that whilst the revision and exam experiences are distinct there are correlations between elements of each. Furthermore, factor analysis revealed three distinct dimensions to revision: Satisfaction with Revision Resources, Revision Design and Learning from Revision. This demonstrates the value of effective revision design on the student experience and shows that understanding how students revise needs to take place in parallel with understanding what learning analytics - or more precisely revision analytics - can tell us about this revision. How can analytics provide insight into the tasks that students undertake whilst revising such as reflection, new learning and exam preparation? How does this period of study impact on student retention and progression and how is it linked to learning activity earlier in the module? What is certainly clear is that revising for assessments forms a pivotal bridge between student learning and examinations and between the quality of progression between one module and the next.

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REFERENCES

- [1] Ellis, C. 2013. Broadening the scope and increasing the usefulness of learning analytics: The case for assessment analytics Colloquium, *British J. of Educational Technology*, 44(4) 662-664.

- [2] Quality Assurance Agency for Higher Education. 2007. Integrative assessment: Monitoring students' experience of assessment. QAA: Mansfield. ISBN 9781844826476.
- [3] Bennett, R. and Kane, S. 2014. Students' interpretation of the meanings of questionnaire items in the National Student Survey. *Quality in Higher Education*. 20(2), 129-164.
- [4] Quality Assurance Agency for Higher Education. 2007. Integrative assessment: Monitoring students' experience of assessment. QAA: Mansfield. ISBN 9781844826476.
- [5] Richardson, J.T.E., Slater, J.B. and Wilson, J. 2007. The National Student Survey: Development, Findings and Implications. *Studies in Higher Education*. 32(5) 557-580.
- [6] Gibbs, G. and Simpson, C. 2003. Measuring the response of students to assessment: the Assessment Experience Questionnaire. Paper presented at: *11th Improving Student Learning Symposium*
- [7] Tong, V.C.H. and Chow, D.S.L. 2012. A study of student participation in prelecture electronic surveys. *British Journal of Educational Technology*. 44(5). 869-880.
- [8] Hashim, A.S., Ahmad, W.F.W. and Rohiza, A. 2011. Mobile learning course content application as a revision tool: The effectiveness and usability. *Proceedings of the 2011 International Conference Pattern Analysis and Intelligent Robotics (ICPAIR)*. 184-187. IEEE: New Jersey.
- [9] Nicol, D. 2007. E-assessment by design: using multiple-choice tests to good effect, *Journal of Further and Higher Education*, 31(1), 53-64.
- [10] Payne, E. and Brown, G. 2011. Communication and practice with examination criteria. Does this influence performance in examinations? *Assessment and Evaluation in Higher Education*, 36(6), 619-626.
- [11] Evans, C. 2008. The Effectiveness of m-learning in the form of podcast revision lecturers in higher education. *Computers and Education*, 50(2). 491-498.
- [12] Entwistle, N. and Entwistle, D. 2003. Preparing for Examinations: The interplay of memorizing and understanding, and the development of knowledge objects. *Higher Education Research and Development*, 22(1), 19-41.
- [13] Hecking, T., Ziebarth, S. and Hoppe, H.U. 2014. Analysis of Dynamic Resource Access Patterns in Online Courses, *J. of Learning Analytics*. 1 (3), 34-60.
- [14] Pulker, H. and Vialleton, E. (2014). Online revision and assessment on a beginners' French course: using learning analytics to understand language learners' behaviors. In: *CALICO conference 2014: Open, Online, Massive: The Future of Language Learning?*, 6-10 May 2014, Ohio University.
- [15] Papamitsiou, Z. and Economides, A. A. 2014a. Temporal Learning Analytics for Adaptive Assessment. *J. of Learning Analytics*, 1 (3), 165-168.
- [16] Papamitsiou, Z. and Economides, A. A., 2014b. Students' perception of performance vs. actual performance during computer based testing: a temporal approach, *8th International Technology, Education and Development Conference*, Valencia, Spain
- [17] Cross, S., and Whitelock, D. 2010. Benchmarking Assessment: breaking down barriers and building institutional understanding, *CAA Conference*, 2010. Retrieved from <http://caaconference.co.uk/pastConferences/2010/Cross-CAA2010.pdf>
- [18] Kimberley, A.E., and Matthew, P.M. 2012. Course Signals at Purdue: Using Learning Analytics To Increase Student Success. Paper presented at *LAK12: 2nd International Conference on Learning Analytics and Knowledge*. 30 April - 2 May, Vancouver, Canada.
- [19] Nonis, S. A., & Hudson, G. I. 2006. Academic performance of college students: Influence of time spent studying and working. *J. of Education for Business*, 81(3), 151-159.