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HOW WOULD VIRTUAL LEARNING ENVIRONMENT (VLE) ENHANCE ASSESSMENT FOR LEARNING MATHEMATICS BY THE SPECIAL EDUCATION NEEDS STUDENTS (SENS) IN SECONDARY EDUCATION SECTOR

Abstract

This paper is a pilot study that investigates how the use of virtual learning environment can enhance or support assessment *for* learning mathematics by the KS4 students with special education needs in school sector, and then reports the finding. A virtual learning environment is an electronic system that can provide online interaction of various kinds that can take place between learners and tutors, including online learning and assessment (JISC, 2003). It is a learning platform that supports teaching and learning programmes, such as AfL (assessment for learning). The platform also encourages personalised and collaborative learning, enabling students to carry out peer and self assessment. The finding suggests that VLE enhances assessment for Learning by offering instant feedback and feed-forward to SEN students who thus take responsibility for their own learning, and have also been motivated to correct their work. Furthermore, evidence of teacher – student interactivity which facilitates greater understanding of mathematical concepts is highlighted by the study.

Keywords: Virtual Learning Environment (VLE), Assessment for learning, Teaching methods, Mathematics, Key Stage 4, Secondary education sector, Fronter

Introduction

The way academic practices in higher, further and school sector education responds to the influence of computer networks and technology is central to immediate and future role of educators in creating a viable teaching and learning environment. Fuller and Soderlund (2002) argue that the process of legitimising knowledge (Justification) is a social process, and whereas knowledge is related to social action, information is conceived as a flow of messages enabling the creation of knowledge. The driver of academic practices through virtual learning is that of the creation of one's own knowledge which amplifies the process of creating meta-conceptual understanding. Today, technology resources are vital to creating an environment that is interactive and personalised. Web-based information systems including online data resources have continued to be more prevalent in our educational activities. Greenwood (2010) states that students, teachers and school administrators face the growing challenge of accessing data from a variety of sources. He further suggests that it is now a common place to find a multitude of WebCT-based systems in a typical school, college or academy environment that teachers and students are required to use as part of their daily routine (Greenwood, 2010). In 2008 schools in England were encouraged to embrace the use of virtual learning environment in preparation, teaching and delivering of lessons to learners

(Becta, 2008). For this reason, all schools have adopted the use of the VLEs in teaching, learning and assessment. A VLE has many benefits and functions that would support students' progression in their courses, particularly the special educational needs students in areas such as out-of schools learning, personalised, immediate in-class and out of school assessment, (Becta, 2007). A virtual learning environment is a set of teaching and learning tools designed to enhance a student's learning experience by including computers and the internet in the learning process. A VLE provides components in which learners and tutors participate in several on-line interactions, including on-line learning (Silva, Costa, Rogerson, and Prior, 2007). The principal components of a VLE package include curriculum mapping (breaking curriculum into sections that can be assigned and assessed), student tracking, online support for both teacher and student, electronic communication (e-mail, threaded discussions, chat, Web publishing), and internet links to outside curriculum resources (TechTarget, 2009). The VLEs offer the ability to schedule a range of learning activities and make tools available rather than just manage content (Sclater, 2009). Users are able to explore social situations and "try out" different behaviour responses for a variety of simulated social interactions (Kerr, Neale, and Cobb, 2002). A numbers of VLE software packages are available including Blackboard, Fronter, WebCT, Lotus Learning Space, Moodle and COSE. The virtual learning environment which serves as supportive tool in education can enable appropriate modification in curriculum, teaching methods, personalised assessment, educational resource, medium of communication or the learning environment, thereby catering for individual differences in learning (Ministry of Education, 2009). Williams, Jamali and Nicholas (2006) suggest that the VLEs are particularly useful for people with autism and may provide the ideal method for social skills training. Evident from Wilson's study indicates that learners with special needs in mainstream schools are very reluctant to follow a curriculum which they perceive as having little 'surrender value (Wilson, 2006). It is my contention that a VLE will enable such learners to acquire skills necessary for today's job market. For the purpose of this paper, special education needs refer to a range of educational and social services provided by the public school system and other educational institutions to individuals with disabilities who are in their KS4 sessions and between 14–16 years of age.

Design and Methodology Approach

A group of twenty special education needs students (SENs) students at KS4 level were used in creating a case study approach in this study, enabling me to scale down the sample size to a manageable number of students. Hopkins (2002) suggests that one of the advantages of a case study is its relative importance in plotting a group's reaction to learning and teaching. The case study is an ideal research strategy when holistic, in-depth investigation is needed, allowing for a mixed methods approach in data gathering, bearing in mind the focus of the investigation which is; how would virtual learning environment (VLE) enhance and support Assessment *for* Learning in mathematics for KS4 students with special educational needs.

Designing the Direct Observation

A small focus group of the special education needs students with various disabilities were used to create a case study approach. Interview, questionnaire(s) and observation tool(s) were used in the study; this enabled me to verify techniques and to ensure they were suitable. In order to gain more insight into the impact and characteristics of virtual learning environment in the 'Assessment *for* learning', I addressed both quantitative and qualitative aspects of the virtual learning environment tools used in teaching and learning mathematics in the school. The operationalisation led to a standard observation scheme which includes the curriculum and didactic characteristics (whether or not specific types of virtual learning environment were used in the school for teaching and learning), and include:

a) Degree of curriculum differentiation within KS4;
b) Access to virtual learning environment (number and types of computers, location, computer room);
c) Characteristics of virtual learning environment in use (School version);
d) Difficulties experienced in by the special education needs while using a virtual learning environment in mathematics lesson;
e) Access to a virtual learning environment for support as a teaching resource, enabling assessment *for* learning;
f) Ease of virtual learning environment use, the associated problems and impact on students' assessment for mathematics learning;
g) Student's current situation.

Administering the Observation

The participants were the special education needs students selected from a KS4 class group. This group forms a representative part of school population. Mathematics lessons were taught to these groups over two weeks (10 day) period for one hour per lesson. Each lesson was held in a virtual learning environment room (lab room) with computers set aside for this observational exercise. At the end of the period, a simple test plan was drawn by the teachers, and students answered questions on the virtual learning environment platform. I entered the classroom unannounced and students were asked to fill in the questionnaires accompanying the test plan online. The answers were recorded and observation data was triangulated against the questionnaires and interview data from the teachers. The likert – type items, alpha scale construct was carried out and Cronbach Alpha Coefficients were calculated using Statistical Package for the Social Sciences, otherwise called Predictive Analytics Software (Field, 2005) which shows an acceptable reliability of 0.83 (see Triangulation and Validity below).

Data Management & Analysis

The three phases of data management – data preparation, data identification and manipulation, including data cleaning processes was adopted in this pilot study. For data preparation, the coded survey instruments were entered into the Predictive Analytics Software version 17.0 for analysis. The data identification involves dividing texts into meaningful identifiable sections of information (Yin, 1994). Data

manipulation involves putting the quantitative data through the rigours of analysis that is relevant to my research questions. Data cleaning which is a process of intuition – knowing where and when to stop data collection and validate your existing data for errors i.e. your cut off point during data collection. The process of storing and coding data was made possible through the use of Predictive Analytics Software which generated descriptive statistics (means, standard deviations, frequencies, percentages, minimum, maximum, correlations and reliability indices) for a set of data, enabling comments to be made about frequency. Cross (2010) suggests that analyses using descriptive statistics rely on arbitrary decisions about size and about what constitutes importance. The study made use of Cross tabulation in measuring any significance between items under personal background, and Cronbach Alpha Coefficient was used for instrument reliability. The reliability test enabled opinion on the reliability of items such as teaching and assessment *for* learning as goals, practices, processes and statements of opinion in relation to virtual learning environment.

Triangulation and Validity

Triangulation refers to the use of more than one approach to the investigation of a research question in order to enhance confidence in the ensuing findings. Usually data collected from different sources reveal a range of views from the respondents about phenomenon and to compare what the respondents are saying in order to gain their trust. I employed triangulation technique in order to cross-reference ideas for validity, reliability and objectivity. The mixing of data types known as triangulation is often thought to help in validating the claims that might arise from an initial pilot study (Wendy, 2004). Pavot, Diener, Colvin and Sandvik (1991) in Pallant (2007) report that the reliability and internal consistency, with Cronbach alpha coefficient of 0.85 is good. In the current study, reliability statistics shows the Cronbach alpha coefficient of 0.83; this indicates a very good reliability and internal consistency.

Research Findings

The research highlighted pedagogical, practical and strategic issues in using virtual learning environment platform for learning assessment, especially for the special education needs students at KS4 education sector. (By pedagogical, practical and strategic issues in using virtual learning environment, I mean: (a) interactive mathematics teaching and learning, a measure of assessment *for* learning, learner centred and constructivist in nature; (b) meeting students' needs, teachers needs, time on task, reciprocity and cooperation among the special education needs students, and prompt feedback; and (c) working understanding of virtual learning environment, training and professional development of teachers and technologists). The twenty students who received in-class feedback and feed-forward during mathematics lesson, and via the school version of virtual learning environment (Fronter) seem to move their learning forward and much quicker when compared with students who only received feedback in the class. However, there is evidence of teacher – student interactivity, where students receive immediate feedback during the lesson; this facilitates understanding quicker than giving feedback and feed-forward through the Fronter platform, especially with low ability students. It was also evident that the virtual learning environment motivates all students and supports

assessment for learning, for example, peer and self assessment. The study found that the students were able to use the 'Fronter' platform (school version) to learn, set target and manage their learning. The mathematics teacher was able to create new conversation within the platform and teach to students new lessons for a period of ten days, following, students were assessed. The study suggests that students were able to set their personal goals and carry out self assessment when directed by the teacher. The study confirms that the virtual learning environment – 'Fronter' strongly supports all the elements of curriculum on mathematics entitlement and choice. Students were actively involved in the process of learning and assessment within the Fronter platform, and were enthused at the extent to which they have used the platform as a learning tool which underpins the argument that virtual learning environment contributes to learning and teaching of students. There is evidence from the analysis of data collected via the Fronter that those students who receive constant feedback and guidelines for improvement both in the class and through 'Fronter', performed better than other students who did not. The 'Fronter' offers students in the research group an opportunity to self assess their work in real time to see how they have performed, and possible areas of improvement before finally uploading their work. These students were able to carry out peer assessment by first of all, saving their work in the student folder; this allowed other students to access these work and make comments. As students were given feedback and feed-forward that is relative to their learning ability, personalised access to learning and assessment were achieved. This also promotes independent and interactive learning which in my view raises confidence and engagement level of the learners on their learning process. All the students indicated that they enjoyed using virtual learning environment to carry out peer assessment exercise since it availed them the opportunity to look at other student's work in order to give feedback and gain more understanding. The students confirmed that it was helpful to receive feedback and guidelines on the required work improvement from fellow students, enabling students to carry out peer and self assessments. The result of perceived impact of virtual learning environment on students' learning before and after the observation on 'Fronter' shows that majority of learners testified that their mathematics skills was not very good before using the virtual learning environment in the mathematics class. Their lack of enthusiasm and unable to discover mathematical concepts seem to contribute to lack of skills and de-motivational attitude towards mathematics, leading to under achievement and poor records in mathematics. The instant feedback provided by 'Fronter' after the observation stage was greatly valued by students who used this period to take greater responsibility for personal learning. They also show greater motivation and confidence in their learning and assessment by correcting their works through feedback and feed-forward, discovering patterns, concepts and relationships; thereby building confidence as they express themselves freely through speech and text. Review of literatures seems to suggest that virtual learning environment has added quantities of declarative knowledge and concepts to learning, thus special education learners make more use of pictorial than abstractions (NCTM, 2000; Scott, 2008). The learners are also good at moving images and designing objects within the platform and because they are visual learners, they make use of manipulative within the VLE to engage lerning. Furthermore, the provision of access to assessment data by the students allowed teachers to address

any personal or group misconceptions immediately during the lesson. Finally, achievement on the overall linearity increment on mathematical concepts acquisition amongst learners was achieved; enabling confident building, assessment based problem – solving and knowledge construction skills by the students' group.

Conclusion: The Changing Student Roles in Learning and Assessment

This study reveals that the role of learning and teaching from the perspectives of the special education needs students and the teachers are changing with out us realising this change. The special education needs students who participated in this study were enthused when introduced to the use of virtual learning environment in a mathematics class. They showed great sense of motivation and were able to personalise and move their learning forward. Goodyear (2002) developed a number of indicators that show how the tutor and student roles might be expected to change as teaching, learning and assessment finally move into an online environment; these indicators include:

1. From passive receptacles for hand-me-down knowledge to constructors of their own knowledge;
2. Students move from memorising facts towards solving problems;
3. Students view topics from multiple perspectives;
4. Students devise their own questions and search for their own answers;
5. Students work as group members on more collaborative/co-operative assignments: group interaction significantly increased;
6. Increased multi-cultural awareness;
7. Students work towards fluency with the same tools as professionals in their field;
8. Increased emphasis on students as autonomous, independent, self-motivated managers of their own learning;
9. Discussion of students' work in the classroom and peer to peer assessment;
10. There will be a change in emphasis from receiving information from the teacher, and learning to 'pass the test' towards using knowledge not only to pass the test, but on every day activity;
11. Emphasis on developing effective learning strategies (both individually and collaboratively);
12. Students have greater access to resources, feedback and feed forward.

The benefits of using a virtual learning environment has been embraced by students and teaching staff as a means of providing an integrated and versatile support mechanism for assessment. This study notes that virtual learning environment supports assessment for learning personalised, autonomous and collaborative learning. However, there was also a concern that mere use of the platform may not bring about significant improvement in students learning. The learning pathway functionality of virtual learning environment; whichever version used, allows for greater differentiation with programmes tailored to individual student's needs (not explored in this study). The study reveals a substantial increase in collaborative learning between students which is attributable to the use of virtual learning environment. It is noted that the greatest impact of the use of the platform can be achieved if teachers are also experience users who integrate its use right from the very start of their teaching in a mathematics lesson. This study also reveals that

teachers have yet to exploit the creative power of the platform in order to engage students more actively in production of knowledge. In my opinion, the impact of the platform is dependent on the ability of teachers to fully exploit the technology effectively for pedagogical purposes; however, factors beyond teachers' control – such as institutional cultures, leadership, financial, curriculum and assessment may influence or limit the uptake. In general, for schools to be able to provide inclusive and differentiated education, the use of virtual learning environment is of necessity in our current educational dispensation.

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