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# Effectiveness of Peer Assessment in a Professionalism Course Using an Online Workshop

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## Abstract

An online Moodle Workshop was evaluated for peer assessment effectiveness. A quasi-experiment was designed using a Seminar in Professionalism course taught in face-to-face mode to undergraduate students across two campuses. The first goal was to determine if Moodle Workshop awarded a fair peer grader grade. The second objective was to estimate if students were consistent and reliable in performing their peer assessments. Statistical techniques were used to answer the research hypotheses. Although Workshop Moodle did not have a built-in measure for peer assessment validity, t-tests and reliability estimates were calculated to demonstrate that the grades were consistent with what faculty expected. Implications were asserted to improve teaching and recommendations were provided to enhance Moodle.

**Keywords**: Moodle Workshop, learning management system, peer assessment, reliability.

## Introduction

Peer assessment can be a useful pedagogy, but it is not necessarily reliable, especially when completed by undergraduate students (Gielen, Dochy, & Onghena, 2011). If peer assessment was effective faculty could reduce their time spent on grading qualitative course assignments from large undergraduate classes, in addition to using this as pedagogy to improve student learning. Pairwise assessment consistency can be estimated by Kappa interrater reliability (Cohen, 1968). However, there were no best-practices for evaluating the reliability of multiple assessments–beyond two students although the literature contained several relevant studies. Zhang and Blakey (2012) used factor analysis for this while Dollisso and Koundinya (2011) applied t-tests.

Moodle is a popular open source Learning Management System (LMS); Moodle with its siblings Moodle Rooms and Joule are flexible solutions. Moodle Workshop (also referred to as Workshop further in the text) is the peer assessment module, but there are limitations according to practitioner experience (Mudrak, 2011b; Strang, 2013a). Most importantly, Workshop does not have a peer assessment reliability measure. More so, there is very little empirical literature for applying and validating Workshop for peer assessment.



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The goal of this study was to determine if Workshop could assign fair grades using peer assessment and, in parallel, to measure if students were consistent in their peer assessment when compared to faculty. The study sample was a face-to-face senior business course which had a large enrollment across two campuses. The lectures were classroom-based and all assessments were done in Moodle.

# Literature Review and Research Hypotheses

Assessment of outcomes should be linked to learning objectives (Gielen, Dochy, Onghena, Struyven, & Smeets, 2011; Sadler, 2009). More importantly, assessment of learning should be accurate and relevant to student post-graduation needs (Biggs, 2003; Black & Wiliam, 1998). Two important issues that arise when designing assessment instruments are (1) who should be doing the assessing, and (2) how can the results be measured to ensure they are valid (Gibson & Dunning, 2012; Seery, Canty, & Phelan, 2012; Thomas, Martin, & Pleasants, 2011). It would be helpful to provide several basic definitions of key terms before exploring the empirical literature concerning peer assessment in a LMS.

The words assessment and evaluation are frequently used interchangeably in the literature, but they differ in significant ways (Bedore & OSullivan, 2011; Gielen, Dochy, & Onghena, 2011). Assessment results in written, oral, observational, and/or quantitative performance marks (e.g., test scores) that provide information to determine how well a student has progressed toward the intended objectives (Gielen, Dochy, Onghena et al., 2011; Green & Johnson, 2010). Evaluation uses the assessment to make judgments about a student's ability and to inform decisions about continued pedagogy (Gielen, Dochy, Onghena et al., 2011; Green & Johnson, 2010). Therefore, peer assessment is concerned with the grading of assignments by faculty or students based on predefined criteria while faculty will usually evaluate assessment scores to inform pedagogy.

The words formative and summative are often mentioned in the context of assessment. Formative assessment refers to a pedagogical process applied by the professor or students during the course to measure student understanding of the material, as well as to monitor and guide future pedagogy (Gielen, Dochy, & Onghena, 2011; Green & Johnson, 2010). Summative assessment is the evaluation done at the end of the teaching process for a group of concepts, albeit not necessarily at the end of the course (Russell & Airasian, 2012).

Usually formative assessment is completed by the professor through questions posed during the course while summative evaluation is done at the end of a learning unit through tests or assignments with predetermined grading rubrics. Peer student assessments are often summative in nature (Gielen, Dochy, Onghena et al., 2011; Green & Johnson, 2010), but they could be formative depending on the application. "By definition, all student work that contributes to course grades [is] summative. … Grades may be pressed into doing double duty: formative and summative" (Sadler, 2009, p. 808). In his study Sadler (2009) implied that formative and summative peer assessment was useful as far as it provided an extrinsic motivation and intrinsic self-efficacy. Another benefit argued in the current study is that peer assessment reduces faculty workload.

The key theoretical problems with assessment, including faculty-graded assessment, are reliability, validity, bias, and automation using technology. Peer assessment reliability refers to the degree that scores on the assessment are consistent and stable across multiple raters, namely students, faculty or combinations of both (Green & Johnson, 2010). The three common sources of error in peer assessment that decrease reliability are occasion (differences in time and context), items (some raters may not fully understand all criteria or perceive them differently), and scoring issues associated with bias related the relationships between students and their raters (Gielen, Dochy, Onghena et al., 2011).

A clear design using objective rubrics can reduce bias and improve the validity while statistical estimates such as interrater agreement can be generated to measure reliability (Black & Wiliam, 1998; Finn & Garner, 2011; Gibson & Dunning, 2012; Russell & Airasian, 2012). An LMS can be used for peer assessment in order to streamline peer assessment implementation, "off load" faculty work, and to improve the effectiveness of the process as well as to bolster student learning (Bitter & Legacy, 2008).

Peer assessment validity is the extent to which the instrument provides an accurate, representative, and relevant measure of student performance for its intended purpose (Green & Johnson, 2010). Construct-related rigor can be obtained by ensuring the rubric wording is clear. Content-related validity refers to measuring the correct objectives. Criterion-related validity refers to using relevant and easy to understand scoring scales for the raters use, such as "good versus bad" wording, and nominal or ordinal scales, e.g., Likert 1 to 10 ratings (Strang, 2013b).

The validity and reliability of peer assessment can be affected by differences between rater, rubric creator, and student socio-cultural background (Li & Lei-na, 2012; Mok, 2011; Shih, 2011). In fact, researchers have argued that there would be disagreement between raters regardless of whether they were students or faculty (Falchikov & Goldfinch, 2000; Schroeder, Scott, Tolson, Huang, & Lee, 2007). Thus, the pivotal issue driving this study was providing the peer assessment reliability measure that Moodle Workshop does not currently have.

The idea behind randomized allocation or peer evaluators is derived from the concept of the normal distribution because individual differences should average out when the sample size is large (Russell & Airasian, 2012). Therefore, if the number of peer raters was large enough the assessment would be fair. Some researchers argue that evaluator differences should reflect the real world workplace, so this is another argument supporting peer assessments (Goda & Reynolds, 2010).

Falchikov and Goldfinch (2000) acknowledged that faculty may not use peer assessment because they are afraid students will not be able to evaluate assignments reliably or that student marks will not be consistent with what faculty would do. Other researchers concurred with this (Bedore & OSullivan, 2011). Nevertheless, this is an effective learning strategy and pedagogy because students learn how to improve based on the feedback from a formative assessment perspective, and faculty may use the assessment scores as part of the course grading in a summative manner (Black & Wiliam, 1998; Gielen, Dochy, & Onghena, 2011).

Additionally, on the assumption that student assessing is done fairly, peer assessment should significantly reduce the load of the evaluation work especially when enrolment is large and when the assignments consist of long written reports (Gibson & Dunning, 2012). To test peer assessment validity, the first hypothesis was formulated.

H1: Student peer assessment scores will be valid at the 0.80 interrater agreement level.

Falchikov and Goldfinch (2000) performed a landmark meta-analysis of 48 empirical student peer assessment studies, finding that student evaluations of their peers were effective, with Pearson Product Moment Correlation r ranging from 0.14 to 0.99 (mean r was 0.69). They weighted the r calculation by sample size and number of comparisons made. Thus, larger cohorts would have a greater influence on their result. The nature of the subject matter in these studies was generally qualitative assignments which they described as "academic product and process" (Falchikov & Goldfinch, 2000, p. 310).

When Falchikov and Goldfinch examined 48 studies they found the "mean correlation over all studies was 0.69, indicating evidence of agreement between peer and teacher marks on average" (2000, p. 314). This finding indicated that a large portion of these were valid based on the benchmark of 0.70 for reliability (Hair, Black, Babin, Anderson, & Tatham, 2006). The corre-

sponding interrater agreement benchmark set by Cohen (1968) was 0.80 which evaluates to a square root of 0.64 (Strang, 2009) for comparison to a Pearson Product Moment or Spearman correlation R (slightly below the 0.70 cited above). Therefore, R=0.64 (preferably 0.70) is the lowest correlation coefficient between peer assessments which should be accepted to consider that peer assessments were reliable.

Speyer, Pilz, Van Der Kruis and Brunings (2011) searched 2899 studies in the educational psychology literature for the period ending May 2010 to report the use of peer assessment as pedagogy. They concluded that peer assessment was widely used and it was an effective educational intervention to improve learning. Their advice for making peer assessment effective was to use an instrument linked to the learning objectives which has high reliability and validity which is in line with what other practitioners have recommended (Gielen, Dochy, Onghena et al., 2011; Sadler, 2009). In effect what they were recommending from empirical knowledge was to use a rubric to improve objectivity and to increase consistency between raters.

They found most peer assessment rubrics did not provide sufficient psychometric measures to ensure students were receiving a fair result. An important assertion they mentioned was "an instrument for educational purposes can only be justified by its sufficient reliability and validity as well as the discriminative and evaluative purposes of the assessment" (Speyer et al., 2011, p. 583). A limitation of their research was that they reviewed only 1% (28) of those studies in detail, which did not appear to conform to the systematic sampling methodology they planned. Unfortunately, no guidelines were given for benchmarks (e.g., mean acceptable consistency) or by way of methods and formulas to implement peer assessments. Furthermore they did not differentiate between formative versus summative assessment yet according to their discussion the latter was assumed.

Ng and Lai (2012) conducted a peer assessment experiment in an IT-related teacher education program at the Hong Kong Institute of Education in Peoples Republic of China using a Google-sites wiki (N=16). A difference in their experiment as compared to this study was that the teachers were mature and experienced with assessment. In their study, the students had to develop a rubric and apply it. Then students had to provide constructive comments to their peers in order to help improve the content of the learning materials. Students had to rate their own assignment as well as to evaluate their peer assignments.

They detected inconsistency in the student peer assessment process. Interestingly, they found some groups always gave higher scores to peer assignments, but graded their own work lower. Some groups gave higher grades for their own assignments as compared to peers while the opposite condition was observed for the other teams. Regrettably, they concluded "there was no observable evidence that assessment rubrics can serve as viable guidelines for evaluating wiki projects through either self-assessment or peer assessment" (Ng & Lai, 2012, p. 79). Notwithstanding their negative findings, it may be worth emphasizing that the nature of their course content was Internet programming that they pointed out was difficult to assess.

Shafaei and Nejati (2012) examined 59 undergraduate business education students, finding that self-determination significantly enhanced student commitment in the program. A key part of developing self-determination was to include peer assessment and constructive feedback mechanisms in the curriculum. Their recommendation for educational administrators was to mandate learning and assessment.

In their meta-analysis Falchikov and Goldfinch (2000) calculated the correlation R of academic product and process assessments as (0.75 with combined N=39 studies). The cause-effect coefficient of determination r for the peer assessments in the business discipline was 0.71 (N=11). They calculated an overall weighted effect size from 24 experimental studies to be 0.24, which is a large effect (Cohen, 1992; Cohen, Cohen, West, & Aiken, 2003). This indicates that empirical

studies have shown student assessments of their peers to be effective in terms of consistency with faculty evaluations of the same assignment.

Surprisingly, they also found that correlations between student and faculty peer assessment of assignments did not increase as the number of students increased. The optimal number of raters for peer assessment based on meta-analysis research was 3-5; with more raters, consistency drops (Falchikov & Goldfinch, 2000). Interestingly, they found that the quality of student peer assessment did not significantly differ across disciplines or based on tenure of the student (time in the program, such as year 1 versus year 4).

Li (2011) evaluated peer assessment in a project management course (similar to this study) at a university in Georgia (USA). She analyzed student perceptions and outcomes of peer assessment effectiveness as pedagogy. She found that students in early learning development stages showed more learning gains than high achieving students. However, all students held positive attitudes towards their peer assessment experience. This indicates the peer evaluation process was effective as a formative assessment. Li, Liu, and Zhou (2012) conducted a follow up study on this data that confirmed the importance of peer feedback. Their approach was to use assessments during the course to help students self-regulate their learning and also as a mechanism for grading.

Nulty (2011) published a study whereby he recommended using peer assessment early in the students learning cycle. Additionally he cautioned against the disadvantages of using self-assessments due to bias. Goda and Reynolds (2010) conducted an evaluation of a US Military training program. They concluded that peer assessments were useful for program evaluation, and, therefore, this was a relevant technique to increase student learning.

Liu and Lee (2013) investigated peer observation and feedback on student learning during a psychology course in Taiwan. They determined that peer assessment was helpful to students, especially later in the course timeline. An important finding from their work was that students became better at peer assessment after practice. Therefore, an important implication would be requiring students first to complete a practice peer assessment.

Idowu and Esere (2010) interviewed 500 randomly-selected teachers in Nigeria to investigate which assessment techniques were most effective. They advocated a "wholistic assessment measure" which included "test and non-test techniques" such as peer assessments (Idowu & Esere, 2010, p. 342). This is relevant for this study in as far as the peer assessment rubric ought to reflect both qualitative and quantitative competencies, such as clear communications along with accurate budget calculations. Additionally, oral presentations and written reports should be assessed while diagrams and tables should be required in the assignments in order to accommodate the different learning styles of the student and the assignment evaluators.

Some faculty use peer assessments informally rather than as grading mechanisms. Heyman and Sailors (2011) found that traditional peer assessments helped students learn the material better. They also proposed an interesting approach to better understand the perceptions and learning styles between raters and peers by having students nominate their raters. However, this would be time consuming for large classes involving multiple assessments. An important concept arising from their study was to reinforce the idea of students practicing peer assessments. The findings from these studies suggest peer assessments are valuable to use on a formative and summative basis. Nevertheless, randomization does not guarantee immature students will conduct a fair peer assessment. Therefore, a faculty evaluation or previous course average ought to be used to ensure the student ratings are consistent with a subject matter expert. Thus, the second hypothesis was.

H2: Mean student peer ratings will be consistent with a faculty benchmark score.

Most empirical studies investigated above concluded or confirmed that peer assessments were useful in the sense that they helped students to learn. One study did not find that. However, only

two of those studies used accepted statistical techniques to confirm the validity of student peer assessments. Since these studies used a two-pair grouping structure, their approaches were not comparable to this study because here more than two students were assigned to assess peer work. Additionally, none of the above studies evaluated using Moodle Workshop for peer assessment. The third hypothesis was formulated to answer a summative research question.

H3: Moodle Workshop will be effective for administering peer assessment grades.

# Methods and Sample

A theory-dependent positivist philosophy was applied in this study. This philosophy consisted of a deductive literature review to inform the research questions, a valid assessment instrument design, and the application of quantitative analysis methods (Gill, Johnson, & Clark, 2010; Strang, 2013b). Since this study was designed to collect performance data, quantitative techniques were selected to test the hypotheses (Creswell, 2009).

Descriptive statistics, correlation, interrater reliability, and validity tests were applied at the 95% confidence level. SPSS version 14.1 was applied for the statistical tests while Moodle version 2.4 and Workshop version 2.0 were installed at SUNY for this quasi-experiment. Parametric normality checks and then t-tests were used to compare student versus professor rating consistency.

In terms of sampling method, natural intact convenience groups (existing classes) were used at the SUNY Plattsburgh and Queensbury campuses, a public comprehensive university located north of the state capital Albany NY (USA). The enrollment at this university was 6350 matriculated students. From that, 1050 of those were enrolled in the School of Business and Economics. At the time of writing, 350 were in the undergraduate Bachelor of Science in Business Administration (BSBA) program.

The sample size was 114 students spread over two campuses and three sections in adjacent semesters. The syllabus was identical and the same professor taught all sections. The mean age of the sample was 23 (SD=2.1) while females represented 59% of the class. The demographic factor and GPA estimates of the sample were similar to the university's business school population (based on z-score tests). The z-score is a test which can show that the mean of a sample is similar to a population, so generalizations may be made on analysis of the sample (which is the purpose of inductive research). As evidence of sample similarity to the university's business school population, the mean grade of a prerequisite course (advanced econometrics) was not significantly different between these students as compared to their cohort population mean ($Z=1.71$, [$N1=321$, $N2=114$], $P>0.05$). The mean grade was also similar between gender when partitioned by females versus males ($F=4.1$, [$DF=1,113$], $P>0.05$). Thus, it was asserted that the ability of these students was similar in comparison to others at this stage in the degree program (based on performance in a prerequisite course), and the ability of students in this experimental sample were similar between genders.

The course was Seminar in Professionalism. The written assessments included four components: career plan, biography, cover letter, and resume. These were submitted periodically during the course at approximately equal intervals. Each item needed to be one page in length. Peer assessment was the fifth graded element. The course work lasted approximately thirteen weeks.

The grade for each assessment component was weighted evenly at 20%. All assignments were submitted into Moodle Workshop. The scores for the four written assessments were calculated as the un-weighted average of all peer generated scores. The grade for the peer assessment component was calculated by Moodle Workshop using the best assessment algorithm.

Students were randomly allocated five peer reviewers in Moodle Workshop. All peer reviews were based on a rubric (called aspect in Workshop), and each reviewer mark was weighted at 1.

The comparison of assessments of fair (2.5) was specified for all. The professor did not complete a review in Workshop; instead he manually assessed each assignment component using the rubric.

The Workshop module in Moodle is specifically designed to automate peer assessments. A grade is given for the assessment from peers, and a separate grade is given to each student rater. The grade for the assessment is simple - it is the average from all raters (with optional weighting if the instructor wishes to contribute a peer assessment). Assessments may be blinded in order that students do not know whom they are assessing – this was the setting applied here. Self-assessments are also possible, but this was not used in this study due to self-prophecy bias: Students will tend to overrate their own performance. Currently only positive integers (as Likert scales) are available in Moodle Workshop for ratings. This limits the applicable statistical techniques. There are two assessment formats: accumulative or rubric; each functions similarly.

At the time of writing, there was only one method implemented in Moodle Workshop version 2.0 for rater grading, which is called best assessment. The underlying methodology is not well explained, and a pilot study returned inconsistent results where two identical raters (having the same peer assessment scenarios) were given different scores. The basic idea is that the best assessment is identified, and the rater is given a coefficient based on the differences in their scores from the best one for each rubric aspect, $((\text{best score} - \text{peer score}) * \text{weighting} / \text{max possible score}))^2$.

The Moodle 2.4 Workshop module version 2.0 documentation states:

> Grade for assessment tries to estimate the quality of assessments that the participant gave to the peers. This grade (also known as grading grade) is calculated by the artificial intelligence hidden within the Workshop module as it tries to do typical teachers job. There is not a single formula to describe the calculation. However, the process is deterministic. Workshop picks one of the assessments as the best one - that is closest to the mean of all assessments - and gives it 100% grade. Then it measures a distance of all other assessments from this best one and gives them the lower grade, the more different they are from the best (given that the best one represents a consensus of the majority of assessors). The parameter of the calculation is how strict we should be, that is how quickly the grades fall down if they differ from the best one. (Mudrak, 2011b, para 27)

The best assessment was determined for each rubric aspect based on finding the peer assessment grade from all raters that has a standard deviation very close to zero. "In some situations there might be two assessments with the same the variance (distance from the mean) but the different grade. In this situation, the module has to warn the teacher and ask her to assess the submission (so her assessment hopefully helps to decide) or give grades for assessment manually - there is a bug in the current version linked with this situation" (Mudrak, 2011a, para 2).

The grade for assessment (given to a student for assessing peers) is calculated using the comparison of assessments setting in Workshop. That field is then multiplied by the best assessment difference coefficient. The "comparison of assessments values are 5.00 = very strict, 3.00 = strict, 2.50 = fair, 1.67 = lax, 1.00 = very lax" (Mudrak, 2011a, para 3). For a simplistic example, if the best assessment difference coefficient were 10%, and if the fair setting were used for comparison of assessments, then the grade for assessment = 1- (10%*2.5) = 75%.

# Results and Discussion

The student ratings for each of their five peer assessment scores were extracted from Workshop for analysis in SPSS. There were two ways to accomplish that. First, the MySQL tables may be accessed directly (not recommended). Secondly, the picture icons can be set to remain hidden and the screen from the Moodle Workshop may be pasted into an Excel spreadsheet for importing

into SPSS. One column in the spreadsheet will be the mean grade. The peer assessment grades are in rows so these need to be transposed into additional fields beside the mean grade. The professor grade may then be added into the spreadsheet. These six variables along with a student identifier may be pasted from the spreadsheet directly into the SPSS data view (the variable types may have to be adjusted to metric in order to permit the parametric statistical techniques to be performed).

In this study, each assignment received five scores from grader1 through grader5. The average of the five ratings was assigned in Workshop as the Moodle grade. The professor added an independent assessment grade. The descriptive statistics are listed in Table 1. A Kolmogorov-Smirnov test was performed to test if all of the metric fields (grades) were normal; the p-value results ranged from 0 to 0.023 which confirmed all grades approximated a normal distribution.

A Skew and Kurtosis estimate close to or below absolute 1 shows the data are normal; that is a prerequisite for performing parametric statistical techniques (Hair et al., 2006). The assumptions for permitting further reliability analysis using parametric statistical techniques are that the data can be dichotomous, ordinal, interval, or ratio scales, and that the observations (rows) be independent of one another. All of these relevant prerequisites were met for the sample.

**Table 1: Descriptive statistics of peer assessment scores**

| | Mean | | Standard Deviation | Skew | | Kurtosis | |
|---|---|---|---|---|---|---|---|
| | Average | Std. Error | SD | Skew | Std. Error | Kurt | Std. Error |
| Grader1 | 91.553 | .8079 | 8.6258 | -1.037 | .226 | .035 | .449 |
| Grader2 | 88.184 | .8649 | 9.2342 | -.316 | .226 | -1.002 | .449 |
| Grader3 | 91.474 | .7379 | 7.8787 | -.945 | .226 | -.060 | .449 |
| Grader4 | 91.140 | .7947 | 8.4846 | -.759 | .226 | -.615 | .449 |
| Grader5 | 89.623 | .9822 | 10.4874 | -1.251 | .226 | .950 | .449 |
| Moodle grade | 90.395 | .6947 | 7.4172 | -.910 | .226 | .031 | .449 |
| Professor | 91.147 | .6185 | 6.6032 | -1.109 | .226 | 1.079 | .449 |

## *Hypothesis Testing*

In order to test the first hypothesis (student peer assessment scores will be valid at the 0.80 interrater agreement), it was necessary to determine the most appropriate method. Earlier studies cited in the literature review had used factor analysis and t-tests. T-tests are not appropriate for more than two graders. For this reason, many researchers use ANOVA. However, the problem with using ANOVA here is that it measures the variance across groups (all rows) and not the consistency between raters (within the row itself). ANOVA compares group means, but not different peer grades within a row of data. Factor analysis could be used, but again that approach is focused on identifying similarity between fields in a row over all rows, to identify a pattern of factors. It is clear that these statistical techniques are not appropriate for estimating the reliability of peer evaluations. Cohen (1968) developed Kappa as an interrater agreement formula. The problem, though, is that it applies to pairs of scores. It is not designed (in its current form) to work

with more than two peer graders. SPSS can calculate the Kappa as a correlation agreement if the values are summarized into a contingency table, but this was not relevant for the current study since the dataset was in a raw format. A pilot study of this was conducted (Strang, 2013a), but the calculation was found to be very tedious to apply with more than a few rubric (aspect) items and student assignments. Reliability analysis was a logical approach since it was designed for this purpose.

Reliability analysis is a family of statistical techniques that allow a researcher to examine the properties of measurement scales and the items in a structure that composes those scales (Keppel & Wickens, 2004). These techniques estimate the relationships as coefficients between the individual items within a row or within columns of a dataset and generally aggregate the coefficients across all the rows or columns to form an overall indicator or index of reliability.

According to Strang (2009), the appropriate technique to explore the dimensionality of multiple variables beyond two in a dataset could include factor analysis or multidimensional scaling. These techniques identify homogeneous groups of factors while a related technique called hierarchical cluster analysis can visually group similar factors. As noted, Zhang and Blakey (2012) utilized factor analysis. However, there are simpler approaches discussed below.

Correlation is a basic technique which can estimate similarity as the strength of a relationship between two bivariate factors. Inter-item correlation coefficients can be used to compute inter-rater reliability estimates for a matrix of bivariate correlation coefficients.

Alpha reliability is a method to develop a model of internal consistency based on the average inter-item correlation between all the variables (Cronback & Snow, 1981), and more than two may be processed. Therefore, this is an excellent choice of technique for this purpose.

There are several alternative reliability approaches. The split-half approach requires dividing the dataset into two approximately equal parts and then comparing each using correlation – this is not appropriate since the goal is to compare between the rating (grades) in a row. Variations of this include the Guttmans, Parallel, and Strict Parallel models, but none of them would be appropriate.

Intraclass correlation is another approach that may be used to estimate the similarity and thereby reliability of values in a dataset. Intraclass coefficients include single and average measures. A single measure applies to a row such as the ratings of judges or students on the individual item scores, whereas average measure applies to the overall dataset, for example, the average rating for k students. This is an appropriate technique for this study.

Table 2 lists the inter-item (bivariate) correlation between each student grade (1-5) and the professor, with the Cronbach reliabilities on the diagonal. Inter-item correlations may be calculated as the mean of significant and non-significant calculations (Strang, 2009). In this study, the inter-item correlation coefficient for grades of all five students with one another and the professor was R=+0.649 with a range of bivariate correlation R from +0.465 to +0.825 (SD=0.008). Correlation R can be converted to approximate a Kappa interrater agreement by taking the square root, which would be 0.806 (acceptable according to Cohen, 1992). Additionally all of the Cronbach alpha reliabilities were significant and all over 0.70 as specified by (Hair et al., 2006).

Since all of the Cronbach Alpha reliabilities from Grader1 through Grader5 (bolded in Table 2) were above the benchmark of 0.70 (which is equivalent to an interrater agreement of 0.84), the first hypothesis (student peer assessment scores will be valid at the 0.80 interrater agreement), can be accepted. It appears that, overall, students were consistent with one another when rating (grading) the same assignments (per row in the dataset).

**Table 2: Inter-Item Correlation Matrix (N=114)**

| | Professor | Grader1 | Grader2 | Grader3 | Grader4 | Grader5 |
|---|---|---|---|---|---|---|
| Professor | **.757** | | | | | |
| Grader1 | .724 | **.909** | | | | |
| Grader2 | .699 | .706 | **.908** | | | |
| Grader3 | .825 | .653 | .616 | **.866** | | |
| Grader4 | .722 | .589 | .526 | .699 | **.880** | |
| Grader5 | .640 | .577 | .465 | .676 | .621 | **.906** |

The average intraclass correlation coefficient of 0.908 is shown in Table 3 along with supporting descriptive statistics. This coefficient applies to the overall dataset, for example, the average rating for peer students on the assignment. As noted, interaction effects are not processed because it would be illogical to do so (different students could talk with one another about marking the same way but it would be difficult to detect this outside of surveying each person). The intraclass correlation coefficient of 0.908 is somewhat comparable to the Kappa interrater agreement. This provides additional support for the first hypothesis. This information is shown here because the technique is available in statistics software so it may be used in this way to confirm if students were consistent in their peer ratings when using Moodle Workshop.

This intraclass coefficient is the same calculation as the overall Cronbach alpha reliability. Therefore, the benchmark of 0.70 would apply. An additional estimate is available, namely the standardized Cronbach alpha reliability, which is calculated by considering the number of factors and variance. The Cronbach reliability for this dataset was 0.917, which supports the first hypothesis.

**Table 3: Intraclass Correlation Coefficient**

| | Intraclass Correlation[b] | 95% Confidence Interval | | F Test with True Value 0 | | | |
|---|---|---|---|---|---|---|---|
| | | Lower Bound | Upper Bound | Value | df1 | df2 | Sig |
| Single Measures | .623[a] | .549 | .696 | 10.906 | 113 | 565 | .000 |
| Average Measures | .908[c] | .880 | .932 | 10.906 | 113 | 565 | .000 |

a. The estimator is the same, whether the interaction effect is present or not.

b. Type C intraclass correlation coefficients using a consistency definition-the between-measure variance is excluded from the denominator variance.

c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

The second hypothesis (mean student peer ratings will be consistent with a faculty benchmark score) was tested using a pair-wise t-test between the professor score and the mean grade. A pair-wise t-test was selected because there is a natural purposeful relationship between these two vari-

ables in the same row: they were intended to be estimates of the same student assignment. The t-test was conducted both with and without the assumption of equal variances between scores which produced the same results. First though, note that the correlation between peer grade and the professor score was +0.867 which was significant (P=0.000). This indicated that the two were strongly related as a whole. The pair-wise t-test looks at the data row by row.

The results of the pair-wise t-test (summarized in Table 4) were T(113)=-1.812 (P=0.073), which supported the second hypothesis that the student ratings were consistent with the professor. The low t value and p-value above 0.05 indicated there was no significant difference between the two columns of grades (student peers versus professor), which supports the second hypothesis.

**Table 4: Paired Samples Test**

| | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | Lower | Upper | | | |
| Grade - Professor | -.6298 | 3.7119 | .3477 | -1.3186 | .05895 | -1.812 | 113 | .073 |

Finally, the third hypothesis (Moodle Workshop will be effective for administering peer assessment grades) required additional investigation and qualitative reflection to answer. First the researcher examined the rubric ratings to ensure Moodle Workshop properly calculated the average as well as the peer grader grades according to the best-assessment. A sample of 10% was selected (10% * 114 records = 12). The sampling method was random which systematic by selecting every 10$^{th}$ record. Checking the calculations was a labor intensive process since there are five results per single row to verify. The calculations were correct for all of the 12 rows that were examined which is 100% reliability. So mathematically, Moodle Workshop was valid and reliable.

The researcher reflected on the whole process of using Moodle Workshop for the peer assessment. Overall it was effective and efficient. Therefore, the third hypothesis was accepted in that Moodle Workshop was effective for administering the peer assessment process and grading it.

## *Study Limitations*

The limitations of this study, beyond the small sample size of 114 students, are the context of the university, which may not generalize to other organizational cultures or practices. For example, other universities may not feel comfortable using Moodle Workshop, which forces a course into a digital infrastructure to some extent. A disadvantage related to this it the time it may take to initially learn how to use both Moodle Workshop and a statistical package like SPSS to conduct this methodology. Furthermore, this study used Moodle version 2 so it is unknown if the suggestions outlined here would be effective in newer versions of Joule or Moodle Rooms. This should be tested in future studies.

This study used a qualitative face-to-face course in the business discipline – Seminar in Professionalism – thus, the findings may not generalize to other disciplines or to pure online modalities.

Although the students were blinded from knowing who their peer was, those conducting the assessment would be aware of the identity because of the nature of the documentation (containing cover letters). Additionally while some faculty may be comfortable with having students perform peer assessment, they may reject doing this through an online LMS technology. In other situations faculty may not believe in the literature review cited in support having students conduct peer assessments. Finally, some universities may simply not have the ability to use or switch to Moodle LMS due to sunk costs and a change-adverse culture.

# Conclusion

The purpose of this study was to investigate if Moodle Workshop was effective for peer assessment. The quasi-experiment was applied on a Seminar in Professionalism business discipline mandatory course taught in face-to-face mode with undergraduate students across two campuses (N=114). The first goal was to determine if Moodle Workshop would calculate a fair grader grade. The second objective was to measure if students were consistent with the professor in scoring the assignments. Nonparametric statistical techniques were used to test these hypotheses, including Kappa interrater agreement, Cronbach reliability, correlation and t-tests.

The results were that all three hypotheses were supported. Students were consistent in scoring the assignments as compare with one another (based on the Cronbach Alpha reliabilities from Grader1 through Grader5 being above the benchmark of 0.70 and intraclass correlation of 0.907). Students were consistent with the professor ratings on the same assignment, based on the results of a pair-wise t-test(113) = -1.812 (P=0.073), which indicated no significant differences in ratings. Finally, Moodle Workshop was considered effective and efficient based on a qualitative evaluation.

The observed benefits for faculty based on this study were:

- Sharing of peer assessment work;
- Creation and management of assignments in a digital e-portfolio type facility;
- Ability to force students to paste-in (to limit volume) or attach multiple files;
- Automatic switchover from submission to assessment mode on a certain date;
- Random allocation of five (or any number) of students to assess each assignment or instead to require five (or any number) of assessments per submission;
- Ability to allow students who did not submit to conduct a peer assessment.

However, there were two significant limitations or missing features in Moodle Workshop:

1. No Cronbach alpha reliabilities (but this study illustrated how that could be done);
2. Only one peer assessment methodology: best-assessment plug-in.

Students can learn from the peer assessment process, not only about how to assess, but they may also see alternative approaches for applying the theories taught in the course. Peer assessments were formative as well as summative in nature since they were distributed throughout the course schedule, and the scores contributed towards the final grades. Students appreciated the peer assessment pedagogy based on the fact that several made reflective comments in the course opinion survey. Students were very satisfied with this course, which had an overall mean rating of 4.5 out of 5 for the instructional items on the survey (SD=0.8, N=110 respondents).

The researcher noted the most significant benefit from this study was confirming the reliable application of the technology-enabled Moodle Workshop for peer assessments. Although the professor manually assessed every student assignment in this course (N=114), if the Cronbach alpha

reliabilities had been available he could have just randomly sampled a few students to conserve a tremendous amount of time. This methodology would be extremely valuable for large cohorts in qualitative subject oriented courses where there are numerous items to assess.

There are additional implications for saving faculty time by sharing the assessment work. Peer assessment can remove the assessment burden from faculty. This is asserted because the current study has shown that a single reliability measure can be calculated to evaluate the quality of student peer assessment. The literature indicated peer assessment improves student learning. Another point is that conducting a peer assessment is not a particularly stimulating task for a professor, but students may relish in this new responsibility. Therefore, a professor's time could be better spent improving teaching materials, maintaining currency, and mentoring students.

It should be noted though that having students conduct peer assessments is contingent on the maturity level of the student cohort and dependent on the type of assessment instrument. For example, Workshop seems ideal for qualitative data such as written essays, but it may not work well for verbal/physical observations such as interviews or presentations. To that end, it is suggested researchers explore other forms of peer assessment assignment types in Moodle Workshop.

It was mentioned in the limitations that students did not self-assess their own work. This was the intent of the design for this study. However, students could rate their own work as a method of identifying if they are high or low raters. An interdisciplinary perspective could broaden our understanding of the phenomena. Glasser is well-known for his reality therapy theory whereby he believed that individuals consistently rate themselves lower than peers, and many employers use self evaluation as an informative process during job evaluations to identify improvement (Cherryholmes, 1992). Glasser's argument makes sense because people generally know their own weaknesses more than their peers would; thus, self-assessments would serve a useful learning purpose. Moodle Workshop has the capability to allow self-assessments which could be weighted at zero for grading, thereby allowing the comments to serve as reflective constructive feedback to students (formative feedback, but no summative impact on grade).

One suggestion for future research would be for the Moodle software developers to implement a Cronbach alpha reliability or Kappa interrater agreement statistical index into the LMS Workshop module. This suggestion would give the professor a single measure representing the consistency of the student peer assessment activity. It would also indicate which students did not provide a reliable and consistent peer assessment. From that, professors could adjust the student grades and provide constructive feedback to students about their peer assessing skills, substantiated with scientific evidence (rather than observations of the work done). At a minimum it is suggested Moodle software programmers ought to add a grade export feature in Workshop.

Finally, although this study was conducted with a management course in the business and economics discipline, the concepts and practices are readily generalizable to other disciplines. To that end, faculty and researchers are encouraged to investigate this line of analysis with other courses across the disciplines.

It was proposed that peer evaluations might reduce the workload of faculty who are required to teach large sections of classes. Even more importantly, the most strategic benefit is that time of professor would be better spent mentoring students instead of evaluating them. Certainly more studies of this innovative practice will need to be completed and published before we can form any long term practice improvements.

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# Introducing E-portfolio Use to Primary School Pupils: Response, Benefits and Challenges

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## Abstract

Electronic portfolios (e-portfolios) have a positive impact on the learning process in a broad range of educational sectors and on learners of all ages. Yet because most e-portfolio-related studies are about their implementation in higher education, this type of research is less usual in the early childhood context, and there is no available research for Greek schools. This study aims to investigate the impact of e-portfolios on learning in a Greek primary school and to provide a resource regarding the educational benefits of e-portfolio in primary education. To do that, it employs the qualitative naturalistic method to collect data, along with mixed methods which were used to achieve triangulation and strengthen confidence in the outcomes. Participants in the research were fourteen 8-year-old pupils, and one of the researchers was their regular teacher. Data evaluation revealed that the e-portfolio added value in pupils' learning, acted as a medium to involve parents, promoted pupils' self-esteem, and was acknowledged as a valuable assessment tool and a challenge for the school community. Based on the experience of the e-portfolio implementation, the authors provide some suggestions that would possibly help researchers and primary school teachers adopt and develop e-portfolio systems in their particular settings.

**Keywords**: e-portfolio, Greek primary school, learning, PowerPoint, qualitative method.

## Introduction

With the proliferation of technology across the educational spectrum, electronic portfolios (hereafter e-portfolios) have gained popularity as a means of assessment and learning. Nonetheless, most studies concerning e-portfolios focus on and are related to the implementation of e-portfolios in higher educational contexts, while studies referring to their adoption in primary education are relatively few (see for example Hertzog & Klein, 2005;Wang, Kedem, & Hertzog, 2004). In Greek educational institutions, no implementation of portfolios (either traditional paper-based or electronic) in primary education is doc-



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umented, and research is mostly based on international literature and theories. The (Greek) Organization for Teacher Training issued a qualitative study related to portfolio use and evaluation (Vitsilaki-Soroniati et al., 2007) in which it is reported that the use of paper-based portfolios in the classroom is considered as an optional alternative means of monitoring students' progress, and thus it is rarely and not systematically used by teachers. In fact, most of the in-service teachers have no training and professional experience in using portfolios either in the classroom or for their own professional documentation.

Given the wider international acceptance of e-portfolios as a learning tool, yet its infrequent implementation in primary education and in Greek educational settings, this research aims to narrow this gap by providing a case study of the impact of e-portfolios on learning in a Greek primary school environment.

The rest of the article will proceed as follows. First, available literature is reviewed as regards the benefits and challenges of e-portfolio implementation. Next, the aim of this research is briefly explained, and the methodology employed is described. A discussion of the main findings of the study follows, and we then provide some suggestions that address the basic steps for developing an e-portfolio system that could help researchers and primary school teachers adopt and develop e-portfolio systems in their particular settings. Finally, in the last section, the study is summarized, its limitations are discussed and potential enhancements are identified.

# E-portfolio Implementation

## *Benefits*

E-portfolios are valuable tools in learning and assessment procedure. The digitized form facilitates the documentation of the owner's learning and understanding and better represents the owner's personality and achievements (Doig, Illsley, McLuckie, & Parsons, 2006; Irvine & Barlow, 1998). However, e-portfolios are more than mere collections of personal work and artifacts; they encourage reflection, feedback, and exchanging ideas in the depth of time (Doig et al., 2006; Lorenzo & Ittelson, 2005; Maher & Gerbic, 2009; Paulson, Paulson, & Meyer, 1991). They go beyond the limits of paper-based portfolios in which we find an aggregation of paper with text and pictures in loose-leaf binders documenting the owner's progress and skills. E-portfolios are more flexible and facilitate the owner's control of input over time (Paulson et al., 1991; Whitworth, Deering, Hardy, & Jones, 2011), while their ability to include learning documentation in various forms, such as videos, recordings, images, links to websites, and so on, can offer a better view of the owner's progress, evidence of learning and proof of skills (Doig et al., 2006; Hewett, 2004; Ntuli, Keengwe, & Kyei-Blankson, 2009).

Paper-based portfolios and e-portfolios should be examined on a different basis. Challis (2005) identifies their differences and highlights the flexibility, bigger capacity with reduced size, unrestricted access concerning time, place, and people/audience, wider range and types of materials employed, while Jarrott and Gambrel (2011) add environmental friendliness as a reason for their popularity among students and institutions.

Much of the attention around e-portfolios can be attributed to the recognition of the value of the embodied constructivist pedagogies and the student-centered philosophies related to meaningful, authentic activities (Abrami & Barrett, 2005; Barrett & Wilkerson, 2004; Maher & Gebric, 2009). E-portfolios promote nontraditional and multidimensional assessment and, thus, provide a better understanding of student learning and a fair evaluation from the teachers' side (Weller, 2002). Adding to that, proponents of socio-cognitive models emphasize that in order to develop effective self-regulated learning strategies, "students need to be involved in complex meaningful tasks, choosing the products and processes that will be evaluated, modifying tasks and assessment crite-

ria to attain an optimal challenge, obtaining support from peers, and evaluating their own work" (Perry, 1998, p. 716).

Portfolios require the students to reflect on their learning which, itself, constitutes a learning exercise (Doig et al., 2006; Rhodes, 2010; Wang et al., 2004). What is more, different intelligences that may be overlooked by traditional assessment (Dixon & McPhee, 2001) can be incorporated in e-portfolios and provide more in-depth evidence of students' development. As e-portfolios can have a long life span, they are valuable tools in education, allowing teachers to formulate a direct opinion of students' previous learning and learning needs without relying solely on others' judgments (Abrami & Barret, 2005).

According to Becta's (2007) report, e-portfolios are considered to have a positive impact on the learning process in a broad range of educational sectors and on users/learners of all ages (see also Abrami & Barrett, 2005). Learners who face difficulties in planning and organizing their learning find that the portfolio structure scaffolds their attempts and hosts evidence and records of their work. The results of the study also indicate that students think more about their learning while adding work in e-portfolios, and thus reflection is promoted. They feel engaged in their tasks and become more motivated. As the e-portfolios enable students to select and present part of their work to a specific audience, be it teachers, parents, or peers, at the same time they encourage creativity and cultivate the students' self-esteem. When students reach the stage of setting goals and making decisions about the future, then e-portfolios turn into a powerful tool for their professional development.

It has been demonstrated that types of computer-based education can promote learning (Wozney, Venkatesh, & Abrami, 2006); hence it can be assumed that e-portfolios help users develop their technological skills, develop a positive attitude towards learning with technology, learn how to learn, and, thus, encourage life-long learning (Abrami & Barrett, 2005).

## *Challenges*

However, several issues remain under discussion, although they don't necessarily constitute an impediment to e-portfolio implementation and development (Lorenzo & Ittelson, 2005).

Concerning the daily practice in the classroom, there is the argument from both teachers and students that building an e-portfolio can be time-consuming (Attinello, Lare, & Waters, 2006; Hall & Hewitt-Gervais, 2000; Ntuli et al., 2009; Ocak & Ulu, 2009) and discouraging for the non-experts in ICT skills.

Since portfolios vary as much as the students who create them, they offer a different way of assessment from the traditional one; this assessment is not easily measured using the usual numerical ranking (Ocak & Ulu, 2009; Paulson et al., 1991). In addition, Rhodes (2010) mentions the arguments about e-portfolios' lack of reliability and validity compared to standardized tests, when there is a need for comparison.

Valencia (1990) offers reasons on why it is difficult to prescribe what to include in a portfolio or how and when it should be evaluated. She argues that all depends on the curriculum goals and the students, yet she offers suggestions for organizational strategies to make portfolios more useful.

The question about ownership of the portfolio (Rhodes, 2010; Ring & Ramirez, 2012; Woodward, 2000) is raised among researchers and students, though mostly in secondary or tertiary education. The students build their portfolios, decide on the content, reflect on the procedure, and so on. The teachers assist the students but also assess the work that has been done, meaning that they have access to the students' work (Hall & Hewitt-Gervais, 2000). Similarly, parents can visit, comment and thus get involved and control their children's portfolios (Ocak & Ulu, 2009).

Lastly, technical issues such as connectivity and network infrastructure, hosting, access, authentication and security, accessibility, technical standards, and interoperability are widely examined and analyzed and suggestions for measures are made (Becta, 2006; Doig et al., 2006; Irvine & Barlow, 1998; Jarrott & Gambrel, 2011).

# Aim of the Research

The aim of this research is to investigate the impact of e-portfolios on learning in a Greek primary school environment; so far there has been no available research since the use of even paper-based portfolios in Greek education is sparse, unsystematic, and basically non-existent. The purpose of this decision for the research is twofold. Firstly, the introduction of e-portfolios will be monitored in relation to the educational benefits and the pupils' response and active engagement during the process. Secondly, it will provide a resource in Greek literature regarding the educational benefits of the e-portfolio in the primary level of education.

# Methodology

The presented case study employs the qualitative naturalistic method (Creswell, 1998) to collect data following the principles that Cohen, Manion, and Morrison (2005) suggest; the researcher works in a natural context (Bassey, 1999) such as an ordinary classroom in a primary school, the data are detailed and analyzed inductively, and the concern is on the process rather than only on the outcome. The study also follows the descriptive approach as it undertakes the goal to present "a complete description of the phenomenon within its context" (Yin, 1993, p. 5). Thus, the study can be considered valid in terms of honesty and objectivity of the researcher, the triangulation on collecting data, and the participants approached (Cohen et al., 2005, p. 105).

Although the research is conducted within a specific class, it aspires to gain valuable insights regarding e-portfolio benefits from this individual setting that would not have come to light with other types of research (Denscombe, 2007). It can be characterized as an evaluative case study according to Bassey (1999) on account of its attempt to explore the worthwhileness of the e-portfolio in the learning procedure.

## *Data Collection Methods*

The research used mixed methods to achieve triangulation and strengthen confidence in the outcomes and was based on three of the major types of collecting data suggested by researchers: questionnaires, interviews, and documents.

Firstly, a brief written questionnaire (see Appendix A) was chosen as the most suitable to be distributed to the parents of the pupils with the concept of them taking their time in answering. As the questionnaire is voluntary, anonymous, and is addressed to people that are able to read and understand, it allows honest answers and straightforward information. Emphasis was placed on avoiding leading, biased, and vague questions and a combination of closed and open-ended questions was included. These question types were deliberately chosen as the researcher's aim was to gather specific information without discouraging the respondents from the closed questions and catch the authenticity, honesty, and depth of their responses (Cohen et al., 2005, p. 255) with the open-ended questions.

Secondly, a group interview was selected for the teachers of the school since, according to Denscombe (2007, p. 176) and Oppenheim (1992, p. 79) the intention is for a lively discussion to develop, generating a variety of ideas, opinions, and suggestions. More specifically, during the semi-structured interview a hard copy of the questions was distributed to each participant, and a voice recorder was used, allowing the researcher to pay attention to the direction and not the details of the discussion (Bassey, 1999, p. 81).

Finally, pupils' PowerPoint products were seen as diary documents (Denscombe, 2007, p. 229) and evaluated in a qualitative manner; researchers looked for evidence of learning in relation to established standards (Helm & Gronlund, 2000); in improvement of narrative, reflective and writing skills; and in active engagement to the tasks (Irvine & Barlow, 2006; Wang et al., 2004).

## Participants

The participants in this research were 14 children (12 boys and two girls) 8 years of age, pupils of the third grade of a public primary school in a provincial town in northern Greece. For a four-month period the pupils had weekly meetings, of about two teaching hours each, in the school lab and were taught and assisted in building their personal e-portfolios on the school's laptops.

## Stages

The data collection of the research was divided into three stages.

**First stage**. An individual folder was created for each pupil using Google Drive so that the researcher could keep a backup for safety reasons. The folder contained a PowerPoint file, which is considered as easy-to-use software for eight-year-olds. Several researchers suggest that by using PowerPoint, reflection is scaffolded and learning is promoted (Barrett, 2000; Hertzog & Klein, 2005; Hunt, Wood, Terrell, & Isom, 2006; Wang et al., 2004). The PowerPoint file consisted of several slides with a consistent layout and a format of questions regarding description of activity, newly gained knowledge, likes, and difficulties with respective justification (see Appendix B). These would help pupils concentrate and effectively focus on each activity (Wang et al., 2004).

Each slide referred to a specific activity and was accompanied by a distinctive photo of the activity (Hertzog & Klein, 2005). The use of photos was considered significant for the procedure since children interact with images in multiple ways in their lives (Oblinger & Oblinger, 2005; Schiller & Tillett, 2004). Thus, the photos would establish an apt connection between the previously done activity with the pupil's entry and reflection in the PowerPoint presentation. Some slides with personal information (see Appendix B) were also included to strengthen the sense of ownership and raise motivation for participation and contribution (Becta, 2007; Hewett, 2004).

Children's participation in the planning of classroom activities, although not frequent, plays an important role in strengthening collaboration among peers and educators (Sheridan & Pramling-Samuelson, 2001; Woodhead, 2006). In their study Leinonena and Venninena (2012) suggest that it is essential that teachers not only facilitate pupils' participation in planning and decision making in the learning process, but also incorporate their perspectives of what is important for them in terms of learning. Thus, the input for the e-portfolio entries was determined by the pupils during class discussions. Consequently, there was a variety of subjects based on school and extracurricular activities that were of pupils' interest (Clark, 2005; Seitz & Bartholomew, 2008; Sinclair, 2004) beyond what they deemed as ordinary or indifferent.

The idea was for the e-portfolios to be a natural part of the learning process and to help pupils concentrate on learning (Garthwait & Verrill, 2003; Hewett, 2004). The type of process and showcase e-portfolio was decided and the intention was to monitor pupils' progress in narrative skills, reflection, critical thinking, and active engagement in learning.

The e-portfolios made by the pupils were evaluated by their teacher with reference to indications of (a) progress that the children made in narrative skills, (b) their reflection in activities that took place, (c) critical thinking on what they learned, enjoyed doing or found difficult during the activity, and (d) active engagement in learning with reference to their willingness to build and work on their e-portfolios.

**Second stage.** At the end of the project, parents were invited to a class meeting and the pupils presented their e-portfolios, describing the process, explaining their work, and informing them about content. Seitz and Bartholomew (2008) explain that although the e-portfolio is the child's celebration, the parent as audience is also a key component. Furthermore, displaying and sharing children's work in the classroom and parental involvement have a strong impact on child development and on strengthening family relationships (Knopf & Swick, 2007; Seitz & Bartholomew, 2008; Souto-Manning & Swick, 2006).

Parents were asked to answer a brief questionnaire (Appendix A) that investigated their opinions with regards to their children's learning progress related to the e-portfolio use. This action was deemed important for it is a way to monitor children's progress from the families' perspective.

Nine parents answered the questionnaire that followed the e-portfolio presentation. They reported their observations on the portfolio work of their children and how this affected their children's learning. They also put down their opinions about their children's responses to learning and made comments on the portfolio as a learning tool in general.

**Third stage.** The process of building and working on an e-portfolio and examples from pupils' work were presented to teachers of the school and were followed by a group interview that examined teachers' views and opinions on e-portfolio's contribution to learning. The interview focused on suggestions on how-to-use in the classroom, future use, and challenges (see Appendix C). The notion of this action was to explore teachers' perceptions prior to and after the presentation, but also to bridge issues of validity and objectivity (Cohen et al., 2005).

Ten colleagues attended a two-hour session about the e-portfolio project, which included the presentation of some randomly selected e-portfolios, and volunteered to participate in the group interview. During the group interview almost all colleagues contributed with noticeable and encouraging remarks, based mostly on their previous professional experience. They made suggestions for possible uses of the e-portfolios, pondered over their continuation, and discussed added-value in pupils' learning.

# Findings

## *Portfolios Adding Value in Pupils' Learning*

During the evaluation procedure of the pupils' e-portfolios the findings that emerged were similar to previous studies (Calfee & Perfumo, 1993; Irvine & Barlow 1998; Hall & Hewitt-Gervais, 2000; Hertzog & Klein, 2005; Wang et al., 2004). It became clear that the pupils presented significant progress in their writing. In the early stages, they usually merely filled in the rest of a text line or wrote a semi-finished sentence. For instance, under the heading: "Goals for the year" many pupils wrote a sentence in the form "is to get good marks" or "to be better at maths". As the e-portfolio project was evolving and the pupils were assisted by the prompting questions, they showed improvement in articulating detailed and more carefully structured sentences regarding each activity. Adding to that, the pupils expressed their feelings and disposition for each activity every time. The process of reflection, though completely new in their learning practice, became gradually visible in most portfolios. The pupils were answering the prompting questions with full sentences; they accompanied them with meaningful reasoning that explained their choices and opinions on their entries, thus creating more sophisticated texts. As an example, under the heading: "Recording my reading" a pupil wrote:

> In my class we read a poem about bread and my teacher was recording our reading. I had to read it many times. This way I learned to read it much better and I liked the poem be-

> cause it had a very nice content. In the beginning it was difficult for me to read because it had many difficult words. I usually read texts from Greek language much better.

Additionally, another pupil, with a level of learning difficulties and several spelling mistakes in the original Greek text that cannot be presented in the translation, wrote:

> We read a poem about bread. Then, our teacher had our voice on the computer, using a small voice recorder. I was happy hearing myself from the computer. Additionally, I was happy that I managed to read such a big text. I succeeded in reading it well because I knew all the words. I had practiced reading the text at home. Yet, there were some words that I couldn't pronounce well. From this activity I also learned to type better.

All parents agreed that the e-portfolios added value to their children's learning; more specifically, the parents answered that they observed improvement in their children's ability of articulating their thoughts while the majority of them also admitted improvement in their children's understanding, narrative skills, and critical thinking. The following are comments from two of the parents:

> I am very pleased with my child as he managed to describe the activities in his portfolio in an eloquent way and gave me clear proof of his new learning and understanding on the role of him having a school portfolio.

> Given the child's age, he presented a very good and complete work. With his presentation he helped me understand what my child does at school and expressed his personal opinion on several subjects.

In almost all e-portfolios, consistent with Irvine and Barlow (1998) and Jarrott and Gambrel (2011), it was evident and became generally accepted from the parents that the pupils became more adroit and skilled in using the technology. The overall procedure of building the e-portfolio made the pupils more competent in taking initiatives in their learning as it is also described in the relevant literature (Barrett, 2000; Jarrott & Gambrel, 2011; Paulson et al., 1991). A pupil who usually had no interest in correcting his mistakes said, "I know I have spelling mistakes, yet I will correct them later" which he meticulously did before the presentation to parents.

Each week, a vivid discussion initiated by the pupils, lead to the selection of the activity. Henceforth they were able to perform all necessary steps on their own: start the laptop, synchronize with Google Drive, locate and open their folder, insert images, type fast without having to keep notes on paper, revise and save their work.

Throughout the four-month period, the pupils showed constant interest and active engagement in working on the e-portfolio project. The parents unanimously answered that they observed high motivation and commitment levels, that the pupils found substantial purpose in their learning and they were enjoying their work. For example, two parents wrote:

> Although my child does not usually speak about school activities at home, he kept mentioning the portfolio project and the potential educational activities he could add to it.

> I believe that the portfolio motivated my child, promoted his initiative and his resourcefulness and that it is mostly an alternative and interesting method which, in conjunction with the standard teaching procedure, will have the desirable results.

Added to that, the texts within e-portfolios showed that the pupils who usually provided texts with poor syntax on paper or made many spelling errors and showed no interest in correcting these on paper now put effort into improving their texts in the e-portfolio as regards both spelling and syntax. A day prior to inviting parents and presenting their e-portfolios, some pupils revised their entries trying to correct many of their errors.

Responding to the question about changes that parents observed while their children were building the portfolios, a mother described the e-portfolio as "a quite pleasant activity that, although completely unknown to the child, made the child show a positive attitude towards the experience."

All pupils but one, via the respective answer to the parents' questionnaire, expressed the wish to continue using the e-portfolio. Yet, there was also a divergence among parents' answers as to whether there was an issue of too much effort over the project. Four parents answered positively to the question: "Would you say your child wasted too much effort over it?" while one parent remained neutral and the other four parents disagreed with that statement. This could be attributed to the fact that the two teaching hours per week that are, according to the national curriculum, open for a variety of teaching initiatives or cross-curricular activities, were spent on a single project, the e-portfolio.

When the colleagues were asked, they also recognized that the e-portfolios added value in many fields of pupils' learning: in documenting progress, organizing thoughts and activities, and assisting evaluation. They went on with comments regarding the ways these are materialized; a colleague described the portfolio as a medium to approach the child as a learner and a personality. For instance, two colleagues said:

> These e-portfolios seem to assist pupils with low self-esteem and help them improve their self-image since they have their time to work and create something that is their own effort.
>
> The children became apt in using technology in a way that is meaningful to them.

A teacher who was also teaching this class commented, "I can see much clearer now how certain pupils feel and respond to school work."

Yet, similarly to several academics (e.g., Attinello et al., 2006; Hall & Hewitt-Gervais, 2000; Ntuli et al., 2009; Ocak & Ulu, 2009), many of the colleagues agreed that a large amount of time is required for teachers to monitor and gradually evaluate the children's progress.

## *Portfolios for Parent Involvement*

Marks cannot always represent the potential, the abilities or the weaknesses of the pupils in depth (Carver, Lehrer, Connell, & Erickson, 1992; Frederiksen & Collins 1989; Meisels, 1995; Wardle, 2007). Added to that, parents do not have enough time for frequent meetings with the school teachers where they can discuss issues that concern their children's learning progress and needs.

Keeping a portfolio is a way to inform parents about children's achievements and help them better understand children's learning, skills and abilities (Becta, 2007; Hertzog & Klein, 2005; Hall & Hewitt-Gervais 2000; Valencia, 1990; Warwick, 2009). A parent expressed his satisfaction and wrote that "this portfolio gives me an opportunity to see the work that is done at school". Another parent described the e-portfolio as "a medium to present the things pupils do, how they react to these things and their personal opinion about them", while a mother, denoted her satisfaction and wrote after the PPT presentation:

> The portfolio was excellent! I was impressed by the topics' presentation and I am full of happiness because my child did this on her own. I could see progress from slide to slide.

Another parent commented:

> Today's presentation was for me the only time I could be at school during a regular school day and see how my child spends his day here.

A colleague that participated in the group interview admitted that pupils' portfolios could assist teachers in informing parents efficiently:

> An e-portfolio is useful to the teacher as s/he has all the information and details regarding the student at hand. She/he then can be well informed and prepared for the parental meeting and the school counselor briefing.

Similar to related literature (Hall & Hewitt-Gervais, 2000; Irvine & Barlow, 1998; Valencia, 1990) one colleague went on to explain that portfolio files can be gradually enriched by the pupil and the teacher with selected documentation of the pupil's school work for the purpose of parental information and collaboration. Further, another colleague expressed the thought that e-portfolios may assist in creating or strengthening bonds between parents and children over their mutual pride in the children's work. The following are comments from the colleagues during the group interview:

> The qualitative content of the e-portfolio is a tool for the teacher. She/he can better inform the parents and help them see the progress or weaknesses of their children. It is not convenient for the teacher to carry all the paperwork to parental meetings and find quickly what is needed.
>
> We can include documentation of physical activities, like sports or artwork in the portfolio. This cannot be done but in a digital form.

This may prove valuable in cases of parents who are feeling insecure about their children's potential or are not so pleased with the children's school marks and achievements. In fact a mother commented:

> I feel insecure about how my child reacts and responds to the school environment. I thought that he has minimum abilities and cannot cope with school. I am astonished by the way my son deals with school activities. The portfolio presentation helped me see how my child actually feels.

In all cases, in accord with the literature (Becta, 2007; Calfee & Perfumo, 1993; Hall & Hewitt-Gervais, 2000; Irvine & Barlow 1998; Kasse, 1994; Valencia, 1990), parents get the opportunity to discuss their children's learning with the children and not only with the teacher.

## *Portfolios Promoting Self-esteem*

In every classroom there are pupils that are more reserved than others, with a low profile, or slow learners. Quite often these children fail to succeed in the standardized tests or hesitate to participate in the class activities (Blatchford, Bassett, & Brown, 2011; Harlen & Deakin Crick, 2002; Peters, Hartley, Rogers, Smith, & Carr, 2009).

The integration of technology and computer use in the classroom (Becta, 2007; Hatzigianni & Margetts, 2012; Irvine & Barlow, 1998; Wardle, 2007) can be used to strengthen and develop pupils' self-esteem. Building and owning a portfolio is an opportunity for the child to present evidence of learning, abilities and strengths or needs (Arter & Spandel, 1992; Becta, 2007; Grace, 1992; Notari-Syverson & Losardo, 2004; Sewell, Marczak, & Horn, 1998; Smith &Tillema, 2003). A colleague realized that this was also the case for certain pupils in the present case study. When presenting their portfolios, they felt proud, and it was obvious that their self-image had improved. Some pupils discussed their ability to use the laptop:

> I like learning to type and write on the laptop rather than on paper.
>
> I want to write many things in my portfolio but I do not type fast enough and I run out of time.

> I see that I now can type much faster than before.
>
> I can choose what to write about and I can add and change things.
>
> I learned to use the laptop for other reasons than playing computer games.

The presentation of the e-portfolios to the parents was an opportunity for pupils to find substantial meaning in their work. They felt proud of themselves and their accomplishments. For example, one pupil said, "I want to show my mom that I did it all by myself", and after the presentation he went on to say, "It was easier to explain our activities with the portfolio to my mom because I kept forgetting things earlier." A pupil wrote about the e-portfolio, "When I am a grown-up I will be able to see what I accomplished when I was little" while another one spontaneously exclaimed, "Did we actually do all these? I had almost forgotten we did them."

They did not have to worry about comparison and judgment. Confidence and joy were apparent in all pupils. A parent mentioned that he liked the way the child expressed himself and a couple of parents noticed that their children were very enthusiastic about the prospect of presenting their work to their families. Following comments from two parents:

> My son was smiling in joy and anxiety all day till the moment of his presentation.
>
> The work highlights facets of the child's personality that may not be so visible otherwise. It is an opportunity for us to better know our child and for the child to better know himself.

## *Portfolios as a Tool for Assessment*

Not all learners have the same learning pace or manage to learn with the same methods; not all pupils share the same interests, motivation and emotions related to learning, yet, a teacher is called to assess these pupils and evaluate their learning with a range of letters or numbers.

E-portfolios bring to light abilities of the learners that were not previously apparent (Becta 2007; Cooper & Love, 2002; Mueller, 2012; Notari-Syverson & Losardo, 2004; Sewell et al., 1998). The presentation of pupils' portfolios made colleagues realize during the interview that the e-portfolio is much more than an accumulation of tests, essays, and other school paperwork. It is an attractive and flexible learning tool that encompasses broader possibilities in learning. To the researchers, colleagues acknowledged that portfolios could include personal information and other details that reflect the child's personality and, thus, make the way that the child perceives and apprehends things more evident. The presented e-portfolios included documentation of pupils' achievements which, in tandem with the pupils' reflections and comments, indicated their level of understanding and facilitated the evaluation process.

A colleague from the included department, similarly to Hatzigianni and Margetts (2012) and Notari-Syverson and Losardo (2004), pointed out how useful the e-portfolio could be in special education for pupils with learning difficulties since these children can more easily focus on things that are important and meaningful to them. They realize their weaknesses and this is a way for them to prove their value. Indeed, these pupils took their time to work without facing criticism of their errors or their slow working rates by peers.

In the case of two pupils sharing one school laptop and one of them having certain learning difficulties (dyslexia), the collaboration came naturally. The first boy volunteered to type the texts for his classmate and remarked:

> this made me practice and improve myself in typing but most of all I learned a lot from my classmate who knew much more about some activities than I did.

Concurrently, the second boy said in a podcast:

> I am pleased for having, for once, written a sufficient documentation (of his thinking and knowledge which was not previously possible in the usual school work on paper) compared to my textbooks.

In all cases, the digital form of the portfolio added further value allowing the use of documentation in the form of video, images and podcast (Doig et al, 2006; Irvine & Barlow 1998; Valencia, 1990).

The discussion during the interview brought to the surface the issue of time cost for creating and supporting a portfolio on behalf of the pupil. Even more, there was serious questioning from many colleagues about the time that a teacher needs to evaluate and assess a pupil via his or her portfolio. Thus, a colleague pondered:

> How much time can each pupil spend when we have less than thirty PCs for the entire school? Who will be responsible for scanning the docs of each class and supervise the portfolio entries? How much time do we need to read and evaluate each portfolio?

Added to that, teachers expressed their fear of parental interference when pupils work on their e-portfolios at home, which would destroy the genuine pedagogical role of the e-portfolio. The importance is for each pupil to find meaning and intrinsic motivation in the e-portfolio use (Becta, 2007; Grace, 1992; Paulson et al., 1991). When a colleague suggested that pupils may also work on their portfolios at home at their own rate another colleague countered: "If the e-portfolio goes home then all the work will be done from interfering parents and how can we then evaluate the pupil?"

### *Portfolios: A Challenge for the School Community*

During the teachers' interviews the challenges in adopting the e-portfolio use school-wide were also discussed. A variety of suggestions were made concerning the type of questions, topics, and activities to be included in the pupils' portfolios. Among them was the idea of thematic portfolios (e.g., book presentations or reviews) which will be exchanged with or presented to the other pupils. The colleagues also considered the idea of creating a school portfolio where all pupils will contribute with works, feelings, opinions, and comments.

The teachers also realized what Paulson et al. (1991) originally denoted, that the e-portfolios should be under the pupils' control, and thus suggested that they can include individual topics, allowing the e-portfolios to evolve in a form of learning diaries. A tech-savvy pupil could also work from home. In general, with the necessary teacher assistance and guidance, the idea was for the e-portfolio to become a life-long documentation of pupils' progress, to use in high school or other educational levels, and even as memorabilia with emotional value.

All teachers that participated in the interviews were positive and willing to use the e-portfolio, and they requested a thorough briefing as they felt that it was interesting, offered easy access, and it was beneficial for both pupils and teachers. Yet, they claimed that they were not qualified enough to carry out this endeavor without training and technical assistance, a point also reported in other empirical studies (e.g., Earle, 2002; McMahon, Gardner, Gray, & Mulhern, 1999; Wardle, 2007). In addition, they noted the need for additional computers (there is only one computer lab with ten laptops in the school).

## Recommendations

Based on this experience with e-portfolios some suggestions for their use in primary schools are provided. Although implementation experience at the age level of these pupils may not be entirely applicable to the needs of other classes, the following suggestions address the basic steps for

developing an e-portfolio system and can serve as an outline that teachers may adapt to suit their own particular circumstances. The overall process is illustrated in Figure 1.

## *Step 1*

**Determine portfolio's purpose.** The purpose for developing an e-portfolio system may range from subject-specific to general educational goals. In this implementation the aims were to (a) add value to pupils' learning by developing their reflection skills, practicing their narrative, and writing skills and increasing their motivation and engagement, (b) assist parental involvement and understanding of children's progress, and (c) monitor and evaluate the pupils' progress.

**Decide the types of portfolios to be used.** There are various portfolio types and, depending on the established purposes, some types may serve specific needs better than others. Yet, in general, the process and showcase portfolios are preferable for young pupils.

**Select construction and storage methods.** A variety of software is currently available, and their specifications are analyzed and presented in relevant literature.

## *Step 2*

**Specify a collection process.** The criteria on the selection of the activities that will be included in the e-portfolios have to be established in advance: what to include, how to select, when to collect, and who will make the final decision. In this study these were communicated and explained to pupils during the introduction of the e-portfolio project.

**Promote reflection.** Reflection is the core element of the portfolio. This was accomplished by visualization (photos and videos of the activities were selected and inserted in each slide) and by asking prompting questions that bridged images with activities and triggered self-evaluation.

**Cultivate interaction/collaboration/dialogue/feedback.** These are important factors that promote life-long learning in various educational environments. The group discussions over the selection of the activities, the spontaneous peer feedback while working in pairs (sharing a laptop), and the on-action, timely teacher feedback (the teacher was present and guided and supported the pupils while they worked) promoted learning and increased pupils' motivation and active engagement.

## *Step 3*

**Develop an evaluation procedure.** After a period of work, its worthwhileness and impact on the learning procedure should be evaluated and summarized by both pupils and teachers. The evaluation process promotes deeper reflection and may offer valuable information to the teacher for future application. The pupils looked back their overall work, discussed their inputs and experience in learning, and created a new page where they selected their best work and reasoned over it. A podcast reinforced the procedure in a lively manner. Finally, the teacher evaluated pupils' portfolios based on the pre-specified learning aims.

## *Step 4*

**Identify presentation/publishing options.** Through the e-portfolio presentation the pupils find actual meaning in their efforts throughout the school year. When the e-portfolios were completed the pupils presented their work to their parents. This was also a fine opportunity to strengthen family bonds, involve parents, and improve the relations between teachers, parents and pupils. Finally, each pupil received a CD with a copy of his/her e-portfolio.

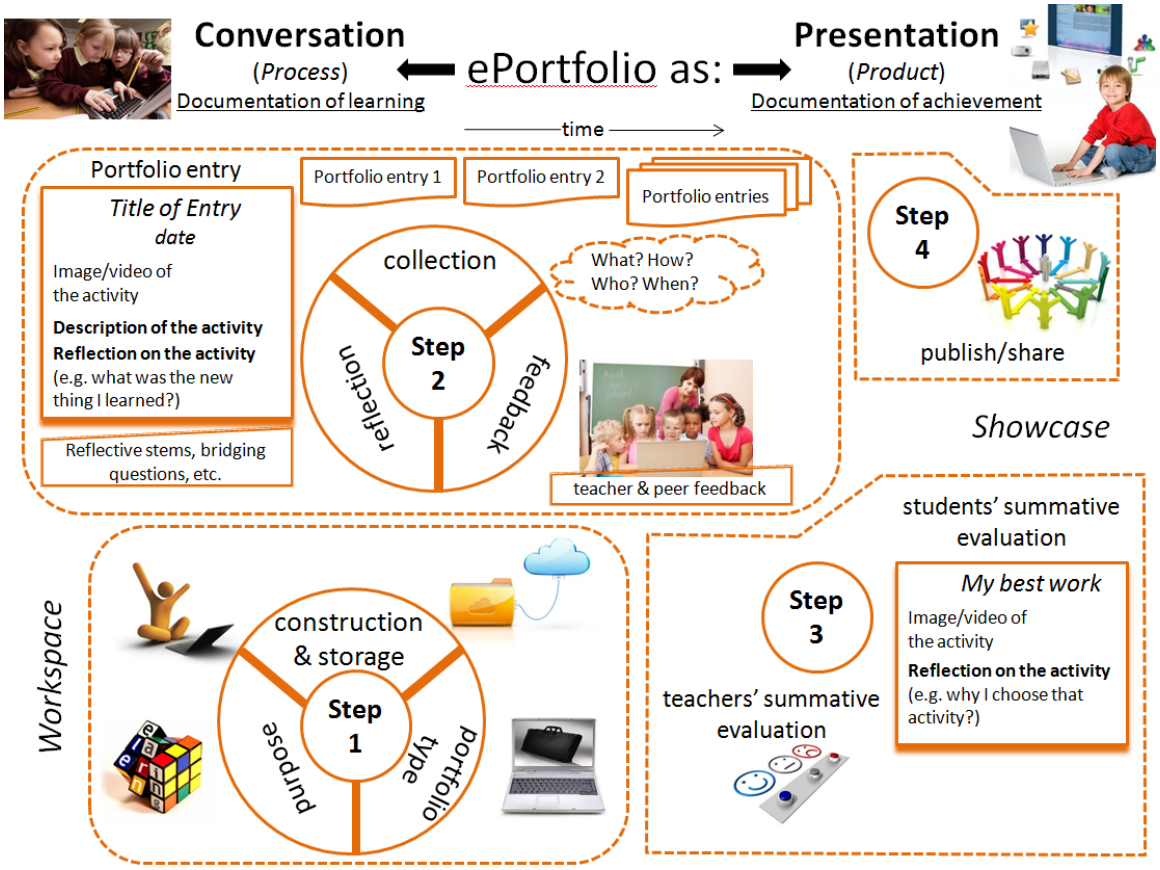


**Figure 1: The e-portfolio development process (adapted from Barrett, 2009).**

# Conclusion

Teaching and learning in Greek schools is based on reading books and textbooks, drills, and practice exercises. Students' evaluation and assessment is heavily related to written tests or other essays, depending on the students' age and level of education, as these are provided in the textbooks and by the teachers of the school. The use of paper-based portfolios is suggested as optional and auxiliary to the existing methods, therefore, it is rarely applied. The present study purports to investigate the impact of e-portfolio practice in a primary school environment. For this purpose, three distinct yet complementary data collection methods were employed: the analysis of pupils' e-portfolios, a questionnaire addressing parents, and a group interview with colleagues at the school.

The pupils worked on the portfolios over a four-month period using PowerPoint software under their teacher's guidance. They decided the activities and they had to reflect on each activity answering the same pattern of pre-set questions. Their work was evaluated with reference to evidence of improvement in narrative, reflective and writing skills and active engagement in the task. The e-portfolio products were presented and explained to parents by the pupils, while a questionnaire followed the presentation to gather parents' opinions related to their children's assumed learning. Finally, some e-portfolios were presented to a group of teachers from the school and the procedure was analyzed and explained to the colleagues. A group interview followed this presentation with the intention of exploring the professional opinions of the colleagues and triangulating the data gathered from the two aforementioned methods.

The findings were in accordance with relevant research (Calfe & Perfumo, 1993; Hall & Hewitt-Gervais, 2000; Valencia, 1990) since the value of the e-portfolio as an effective tool that promotes learning became visible. The analysis recorded progress in writing that became visible through the well-structured sentences. Improvement in understanding, critical thinking, and narrative skills was monitored while describing and presenting the activities. The reflection process was revealed throughout the meaningful descriptions, the reasoning, and the related feelings. The pupils became adroit in using the technology and showed continuing interest and commitment during the four-month period.

The e-portfolios served as a medium for better communication and effective collaboration between teachers, pupils, and parents. The parents expressed their satisfaction at the opportunity they were given to understand their children's learning, skills, abilities, and opinions over the work done at school. It became evident that the e-portfolios contributed to strengthening and increasing pupils' self-esteem, which is also considered valuable in cases of pupils with learning difficulties (Becta, 2007). Furthermore, similarly to relevant literature (Becta, 2007; Cooper & Love, 2002; Mueller, 2012; Notari-Syverson & Losardo, 2004) the colleagues discussed the support that the e-portfolios offer in terms of the opportunity for multiple abilities and skills to become apparent and thus to be appreciated and favourably assessed.

The colleagues were very impressed with the learning benefits of the e-portfolios and they expressed their desire to adopt the e-portfolio in their daily teaching practice. At the same time though, they expressed certain reservations concerning the required technical equipment, as well as the proper training and support for both teachers and pupils.

The present study is also a demonstration that e-portfolios can be fostered and are worthy of the effort by deploying simple tools like presentation software.

## *Limitations*

Although findings were encouraging, there are certain factors that are considered to be limitations and weaknesses of the study.

The novelty of this study in terms of its application in a Greek primary school classroom constitutes a limitation since the pupils reacted positively to an innovative learning practice. One cannot assume that pupils' responses would be the same if the e-portfolio was a part of the usual and ordinary learning procedure. Adding to that, the researchers cannot be sure that the monitored progress is credited mainly to the e-portfolio use or from the overall teaching practice and the natural growth of the maturity level of the pupils.

The fact that the study was conducted in the researcher's working environment and more specifically with the pupils she regularly teaches should also be taken into consideration. The familiarity had already been gained between the teacher and the pupils; yet, it is difficult to perceive how this would work with newcomers, either teachers or newly enrolled pupils, or with a larger group of pupils and the considerably larger workload for the teacher.

## *Dissemination*

The above mentioned limitations of the study can open new avenues for educational research. More research into pupils of the same age is essential, implemented in many schools to add value to the present study. Verification and validity could be controlled by having a control group with a representative sample of pupils who will not use the e-portfolios and merely continue following the regular learning process.

Additionally, an extensive study on pupils of the entire primary-school age-range (6-12) can be employed for the possibility of verification and generalization in findings. Furthermore, a com-

parative study with pupils of different ages, like eight-year-olds and twelve-year-olds, will also contribute to the field since the latter hold a distinct level of maturity and they are on the transition borderline to secondary education.

Future research may also expand to other types of e-portfolio (e.g., thematic, internet-based, group, etc.) in relation to how this may affect pupils' learning and self-esteem, the teachers and parents' collaboration, peer collaboration or socialization and interaction within the school community.

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# Appendix A

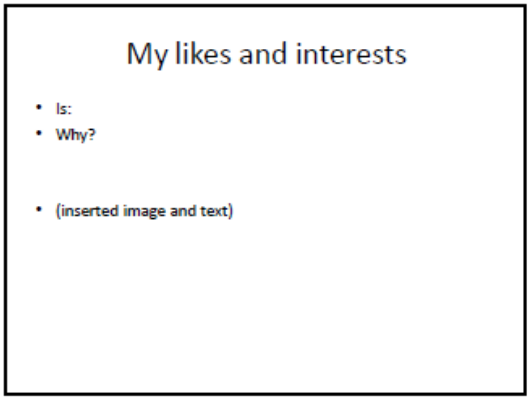
## *Survey questions to parents that followed the pupils' e-portfolio presentation*

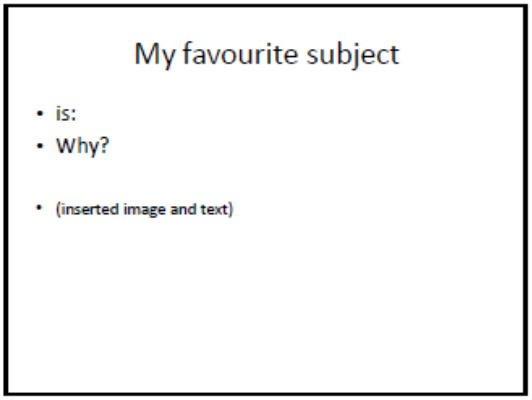
1. Do you think that the e-portfolio added any value to your child's learning?
2. If yes, to which topic? You may choose all that apply: ICT skills, understanding, articulating his/her thoughts, critical thinking, narrative skills, other:……(please specify)
3. Would you say your child: (Rate 1-5, strongly agree-strongly disagree + I don't know/I don't want to answer)
    a. Enjoyed the e-portfolio work
    b. Showed significant interest during building the portfolio
    c. Found it challenging
    d. Learned by doing the e-portfolio
    e. Wasted too much effort over it
    f. Would like to continue using it
4. Did the e-portfolio help you better understand your child's learning than before?
5. Did the e-portfolio help you realize your child's skills/abilities?
6. What changes did you observe when your child was building his/her e-portfolio?
    a. As regards his/her motivation
        a. More motivated
        b. Less motivated
        c. No change
        d. I don't know/I don't want to answer
    b. As regards his/her interest
        a. More interested
        b. Less interested
        c. No change
        d. Don't know/don't answer
    c. As regards his/her commitment to the task
        a. More committed
        b. Less committed
        c. No change
        d. I don't know/I don't want to answer
    d. Other …….. (please state)
7. In general, what do you think of your child's portfolio?

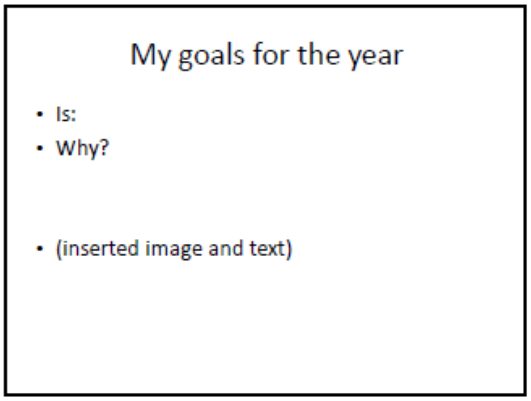
# Appendix B

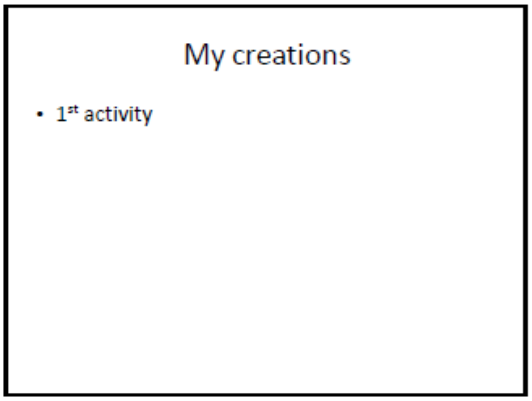
## *PowerPoint Layout*

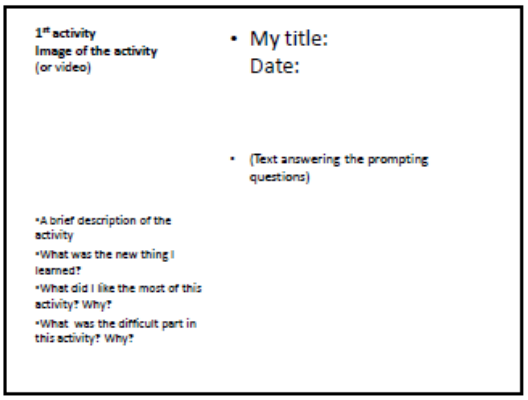


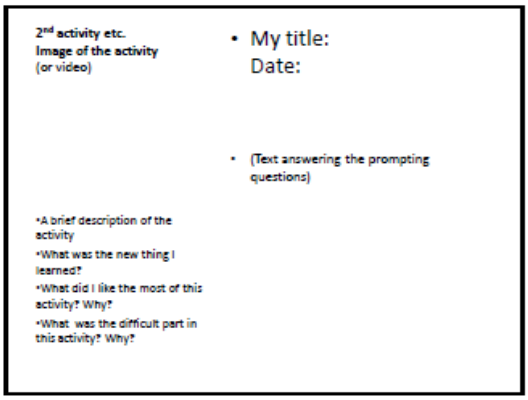







# Appendix C

## *Teachers' interview questions that followed the pupils' e-portfolio presentation*

1. What was your opinion regarding e-portfolios prior the presentation?
2. What do you think now (after the presentation)?
3. What do you imagine the e-portfolio could be used for?
4. Do you have any suggestions on how to use the portfolio idea in the classroom?
5. Do you feel there was added value for the pupils? What kind?
6. What do you envisage the challenges to be for the continuation of these e-portfolios?
7. Would you try to use the e-portfolio with your pupils? Why/why not?

# Biographies

**Dimitra Theodosiadou** received her Master's degree with distinction in e-learning and interactive teaching technologies from the University of Ulster, UK and has 18 years of teaching experience in primary education. At the present, she is assistant principal and teacher in a state school in Drama, Greece. During her teaching career she has taught all primary school subjects in all ages of pupils.

She implements ICT in her daily teaching and applies innovative teaching methods in order to raise motivation and group work, active engagement and interest in learning among her students. With her work she aspires to promote humanism, the value of education and culture, and respect of the environment. Dimitra values the importance of collaboration and knowledge exchange, thus she implements collaborative projects with her class and other European partners that promote ICT literacy and European consciousness among pupils. In general, she pursues initiatives that promote in-school colleague training, extra-curricular activities and collaboration as well as working on topics of international and European interest. The previous year she received training and became Ambassador for the in-service teacher training action of Teachers4Europe, a project run by the European Commission Representation in Greece. Under this mentoring role she organizes workshops to train and guide new teachers/candidates for the action. In collaboration with a group of colleagues, Dimitra started the ICT4ALL initiative (http://ict4all.gr/) for organizing and running professional development courses on digital technologies for in-service teachers.

Her research interests are focused in the use of web 2.0 technologies in primary education and teacher training.

**Angelos Konstantinidis** has a Master's degree in e-learning from the University of Edinburgh, UK and he is a teaching associate at the University of Nottingham, UK and an Information and Communication Technology teacher at the Directorate of Secondary Education of Drama, Greece. He has extensive experience in teaching ICT and computer science subjects to students of all ages – from primary school children to mature adults – as well as guiding in-service teachers on how to integrate digital tools effectively and in a meaningful way in their courses. Angelos believes that teacher collaboration, though challenging it may be, is the basis for creativity and innovative teaching as it allows for a synergy of minds and skills bonded in a synthetic endeavor that no single member could have completed independently. Therefore, he has been actively involved in several pedagogical projects (eTwinning and Comenius - now Erasmus+) in collaboration with teachers across Europe. Additionally, in collaboration with a small group of teachers, Angelos started an initiative titled ICT4ALL (http://ict4all.gr) with the aim to organise and run professional development courses on digital technologies for in-service teachers. At the University of Nottingham he developed and currently tutoring the module "Telecollaboration in Language Learning" for the distance learning MA "Digital Technologies for Language Teaching" and supervises students in their dissertation research. His research interests revolve around the use of social media for educational purposes, online course design, assessment as learning, and telecollaboration.

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# Teaching Social Media in Business

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## Abstract

The ways people connect, interact, share, and communicate have changed due to recent developments in information technology. These developments, categorized as social media, have captured the attention of business executives, technologists, and education professionals alike, and have altered many business models. Additionally, the concept of social media impacts numerous sub-disciplines within business and has become an important issue with operational, tactical, and strategic considerations. Despite this interest, many business schools do not have courses involving social media technologies and applications. In those that do, the placement and focus of the course varies considerably. This article provides motivation and insight into the process of developing an approach for effectively teaching social media use in business. Additionally, it offers implementation examples of courses taught at three major universities. The article concludes with lessons-learned that will give instructors practical guidance and ensure that social media courses taught in a business school provide students with a solid basis for integrating social media into business practice.

**Keywords**: social media, teaching, higher education, business education, course development.



## Introduction

A revolution has crept up on the business world and dramatically altered the way people connect, interact, share, communicate, and even think. The speed with which social media has permeated social and economic practices was rela-

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tively unexpected and not clearly on the radar screen of many futurists (Aburdene, 2005). However, measures of social media use continue to soar. The Nielsen Company (2012) suggests that social media and social networking are maturing as they evolve and "offer consumers around the world new and meaningful ways to engage with the people, events, and brands that matter to them." They also suggest more growth lies ahead, and this phenomenon is global. For these reasons, business education programs must effectively integrate social media concepts and practices into numerous sub-disciplines. Despite the apparent impact, few business schools have integrated social media into programs of study. In those that do offer courses, placement and focus vary considerably.

The primary goal of this article is to provide both motivating factors and practical implementation suggestions for teaching social media in a business school. First, a context for the study is provided to include information about the advent and importance of social media. Next, we review challenges to educators working in this area. Then, a review of existing social media course approaches is provided. Following this general investigation, we offer an approach for teaching social media with attention paid to Bloom's taxonomy adapted to social network environments and to accreditation concerns. Next, we provide practical insight regarding the implementation of social media courses using specific examples from three major U.S. universities. The article concludes with student feedback and instructors' observations in the form of lessons-learned that can be used to jump-start social media teaching efforts.

# Study Context

## *Challenge to Educators*

In July of 2011 a total of 88.4 billion minutes were spent on social media. One year later that total was up to 121.1 billion minutes (Nielsen Company, 2012). According to Pew Research, 67% of Internet users engage in social media (Duggan & Brenner, 2013). Social media use is not limited to personal applications. In fact, business practices are changing dramatically as more companies become part of the social media fabric and choose to use tools provided by Facebook, LinkedIn, Pinterest, Twitter, and others to interact with customers, potential customers, and other stakeholders.

Though social media use offers great promise for business futures, it also poses one of the most significant challenges to educators in recent years. Understanding social media and its application to achieve organizational goals is critical knowledge for the modern business student, in part because it has dramatically changed both student (Junco, 2012, 2013) and consumer behavior (Harris & Rea, 2009). As broader age groups become savvy social media users, the impact promises to be even greater (Buzzetto-More, 2012). Nearly every aspect of business is affected; transaction processing, marketing, recruitment, customer service, account management, and many other areas are challenged to rethink approaches. This further points out the need for business schools to incorporate changes into their curricula.

Changing population characteristics also have contributed to this challenge. Many people born between 1980 and 1994 belong to the first generation to be raised "with the Internet." These people, often called *Tech Savvy Millennials* (Huhman, 2013) or the *digital generation* (Buzzard, Crittenden, Crittenden, & McCarty, 2011), have a different set of expectations than their predecessors. They expect to have readily available information on all topics at all times. They are accustomed to personalizing, customizing, and having the freedom to control information they consume (Thoms, 2012). This makes them, on the whole, a group of consumers less likely to tolerate invasive marketing tools, such as television ads and direct marketing calls, accepted by earlier generations.

Modern business leaders are aware of how quickly social media has permeated the social fabric and have begun to experiment with advantageous use of it. Social media generally permit the identification of new customers and a continuing relationship with existing customers. It also allows information relevant to both potential and current customers to be gathered (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). New venues for business interaction are also available. For instance, a business can build a fan base and receive substantial feedback from targeted individuals. Businesses can mine unstructured social media data as a means to acquire and fine tune business intelligence. Since much of the data on social media is public, information about competitors and competing products can also be obtained. Causal and recreational social media use has developed into a venue for transforming an audience into customers and for transforming customers into loyal advocates.

The current technology-enabled shift in business practices has created a priority for educators. Additionally, there is a growing need to facilitate business students in the exploration, understanding, and integration of social media practices into their areas of domain expertise (Jeffrey et al., 2011; Magro, Sharp, Ryan, & Ryan, 2013). Media attention, student expectations, academicians (Brightman & Nargundkar, 2013), and advisory board pressure have all drawn attention to the need for social media education. Businesses hiring university graduates often expect a level of competency and literacy with new technologies and this has impacted the immediacy of including social media issues in course topics (Levy & Hadar, 2010).

Using another perspective, continued accreditation of high quality business programs must consider evolving technologies. For instance, the Association to Advance Collegiate Schools of Business (AACSB) accreditation standards requires attention to information technology either in the form of specific courses or some other learning experience in the core curriculum. Specifically, Standard 15 of the AACSB (2013) states: "Management of Curricula: The school uses well-documented, systematic processes to develop, monitor, evaluate, and revise the substance and delivery of the curricula of degree programs and to assess the impact of the curricula on learning. Curriculum management includes inputs from all appropriate constituencies which may include faculty, staff, administrators, students, faculty from non-business disciplines, alumni, and the business community served by the school." Though the standard requires a systematic process for curriculum management, it does not mandate any specific courses. However, the published standard suggests that the approved courses will cover skill areas such as the use of information technology. The authors further suggest that such coverage will include IT "as they influence the structure and processes of organizations and economies, and as they influence the roles and techniques of management."

The current impact of social media and Web 2.0 technologies certainly has this influence and, as such, becomes an important element for consideration as future programs of study and curricula are developed in universities.

## *Teaching Social Media in Business Colleges*

As described earlier, social media play an important role in society and in business operations, tactics, and strategies. Approaches to marketing, customer behaviors, decision-making, and numerous other areas have been significantly impacted; therefore, it is important to consider social media's impact in a variety of ways (Shim, Dekleva, Guo, & Mittleman, 2011).

From an education standpoint several approaches to teaching/learning are possible (Chao, Parker, & Fontana, 2011). One approach is to make theoretical material the sole focus of social media and Web 2.0 courses. While this would provide good information to the students, it could take a subject inclined towards hands-on participation and remove important practical elements. Like-

wise, education efforts can focus on applications and miss the big picture, theoretical origins, and underlying reasons for social media use.

Another approach is to sprinkle social media into existing courses as enrichment. In fact, many educators are experimenting with this idea (Deans, 2012; Halvorson, Crittenden, & Pitt, 2011) and have published a plethora of studies integrating social media as instructional devices (Bahner et al., 2012). This approach is consistent with literature suggesting that e-learning improvements are linked to relevant teaching technique changes (Sulčič & Lesjak, 2009). However, teaching in this manner may fail to prepare students with an appropriate depth of knowledge for business use.

It makes sense to integrate social media practices that draw on student experiences from their daily lives (Sacks & Graves, 2012). However, the problem with such integration is that, without a foundation of knowledge, the discussion can seldom move beyond a surface treatment. In other words, integration makes students aware of various technologies but may not equip them with deeper skills required to address and confront long-term business issues. Additionally, students may begin to believe that social media use for business is casual and involves little more than a surface level deployment to be effective. This sort of thinking is currently reflected in many organizations. Hanna, Rohm, and Crittenden (2011) suggest that many companies recognize the need to have a social media presence, but many "do not truly understand how to do it effectively, what performance indicators they should be measuring, and how they should measure them." Potential public relations disasters may also befall a company that does not understand how to appropriately use social media. A single ill-timed or ill-formed tweet or posting may be remembered for years, and in some cases may be more memorable to the public than the company's actual business.

Added to the conundrum is the fact that many educators feel ill-equipped to teach social media practices. They may feel overwhelmed by the volume of social media software, tools, approaches, and techniques. Many educators feel students might know far more than they do in this area (Kelm, 2011; Morgan, 2012). However, some studies find that while this is a perception, it may not be true and that students often use social media in their private lives but not so much in education settings (Thomas & Thomas, 2012). Hrastinski and Aghaee (2012) found that the students they interviewed use social media in their own private lives, yet are critical of its use in education, suggesting it may lead to decreased critical human interaction. Some of their informants felt that "social media is reducing spontaneous interaction and student collaboration," which hindered collaborative learning. They also wondered if reliance on social media and other online resources might suppress their critical sense of discernment.

## A General Examination of Social Media Curricula

Social media is a relatively new Internet phenomenon, and new forms of technology are subject to fads that quickly wane. As such, a professor might question the wisdom of including a topic that they may believe to be highly transitory. However, AACSB guidelines require coverage of IT topics that influence the structure and processes of organizations and economies. As social media could be considered under that requirement, we considered it prudent to examine how many universities were willing to expend significant resources to bolster social media instruction. In particular, it would help determine whether the suggestions in this article – and, further, social media curricula in general – are worth implementing. To this end, we conducted a study on AACSB accredited schools.

We began by examining publicly available course information from institutions listed on the AACSB accreditation website. We searched primarily departments related to information systems and computing disciplines, such as management information systems, computer information systems, computer science, and computer information science. This research focused on undergradu-

ate courses and ensured that content covered salient topics. We found related graduate courses that were more specialized and fell into niche areas. We avoided experimental courses, focusing on programs offering social media-centric instruction on a consistent basis by using catalog descriptions or the closest readily available analog from the university's Web site. We considered these items as evidence of a long-term commitment to social media-oriented material in the curriculum as catalog entries tend to be more laborious to amend or update than, for example, syllabi.

The data collection process followed a procedure similar to one conducted by Lee (2008). Lee suggested a list of course prefixes discovered during an examination of AACSB accredited universities for the collection process. Several additional prefixes were also added to the search. We collected candidate course descriptions and titles from university Web sites and scanned for the specific phrases "social media," "social network," "social networking," and "Web 2.0." We examined descriptions with matching words in greater detail to determine if the course featured one or more substantial aspects of social media as a major portion or main focus of the coursework. We also made other exceptions. For example, one course unambiguously covered social media, but used "Facebook" as an analog in the description.

Catalogs or text derived from catalogs were generally used to determine the inclusion of social media in coursework. Mentioning these subjects in the catalog illustrates faculty have put in time and effort to commit themselves to delivering this material on an ongoing basis as opposed to offering transitory courses and incidental inclusion in existing courses. It also serves to standardize the delivery of social media across all sections of a course, something that otherwise may fall to the personal discretion of an instructor. Furthermore, the catalog was readily available on most websites, whereas additional course materials are often kept behind courseware or password protection, or may not be on the Internet at all. Using the catalog where possible helped standardize our information sources. Only undergraduate courses were used. This is because graduate courses, by the dynamic nature of graduate work and research, may change more frequently and readily at many universities.

A total of 130 randomly-selected English-speaking AACSB accredited business programs with English Web sites and undergraduate coursework were sampled. Findings from this study included:

- 25 (19.23%) programs included one or more courses with descriptions indicating strong social media or social networking content, mostly regarding IS-oriented curriculum other than its design and programming.
- 4 programs included courses with descriptions strongly suggesting considerable social media content, including data mining, analysis or programming, bringing this figure up to a total of 29 (22.31%).
- 8 (6.15%) programs included one or more courses with descriptions indicating strong IS-oriented Web 2.0 content.
- 4 programs included one or more courses with descriptions indicating strong Web 2.0 programming content, bringing this figure up to a total of 12 (9.23%).
- Although not specifically sampled, at least 28 (21.54%) programs included social media coursework involving other departments, such as marketing and communications.

Universities are expected to include material on new technology. The search attempted to eliminate ambiguity, did not include experimental courses nor those including content not specifically described in catalog information, and relied on specific keywords (Lee, 2008). Therefore, it po-

tentially omits courses that have amorphously-worded descriptions which may include social media or social networking content. It may also omit courses that make references to specific Web sites or programs, but no reference to generally accepted terms, such as a course that merely mentions a Web site in its description. This is particularly so if it references sites that are particularly obscure or have shut down. Therefore, the true number of offerings could be greater. However, the findings indicate a reasonable level of teaching social media has emerged in the instructional realm.

## Other Findings: Social Media Minor

One university we investigated during the background research phase offered a social media minor. Although no specific social media courses were listed, this program had enough relevant coursework to warrant a minor. This makes it highly probable that social media material has been diffused throughout several courses to form this option. This approach also may be used in a number of other programs that may not explicitly mention social media-related coursework in their class descriptions. It is worth considering the scholastic aspects of social media not just as a discrete subject, but as a diffuse topic integrated into existing topics and courses.

## Social Media in Departments Other than IS

The background investigation also uncovered findings regarding the proliferation of social media-related instruction in alternate departments, such as marketing and communication. Information systems are only one of many disciplines interested in social media. In fact, social media teaching appears to be widely spread in marketing, non-business fields such as journalism and communication, and even areas such as human ecology. These findings raise questions such as: How do IS academics form productive partnerships with alternate disciplines in order to introduce the larger technological and sociological implications of social media to these audiences, while making certain to emphasize those aspects most relevant to their areas of study and work?

The background investigation also noted that, while social media can be taught in separate courses, it does not inherently require such treatment. It may be diffused throughout an educational program both in terms of general theory as well as practice applicable to particular uses. As such, given its high levels of proliferation into ordinary life, it is entirely possible that social media has become more pervasive in the programs of many disciplines without mention in the catalog, course description, or, in some cases, even the syllabus.

## Web 2.0 Terminology

The treatment of the term *Web 2.0* is another area of interest that yielded information during the background investigation of university offerings in social media. *Web 2.0* is a descriptor used to illustrate a fundamentally different and socially-based way of applying Internet technologies. Web 2.0 is not a specific technical update of underlying software or hardware systems but rather a conceptual change in the way the Web is being used and re-created by businesses, universities, and society. The 2004 *O'Reilly Media Web 2.0 Conference* coined the term *Web 2.0* and this term gained popularity as a way to describe applications that allow people to participate in information creation, digital resource sharing, data classification, social interaction, and automated search (O'Reilly, 2005).

Web 2.0 has been described in a variety of ways from a component standpoint. Part of the reason for this can be attributed to rapidly evolving technologies and emerging application areas. In general, Web 2.0 applications fall into four major interrelated overlapping components: social media, content sharing, filtering and recommendations, and Web applications (McHaney, 2013). These

components share common core characteristics. Professor Andrew McAfee (2006) of Harvard Business School uses the acronym SLATES to describe these commonalities (see Table 1).

**Table 1: SLATES: Common characteristics of Web 2.0 components**

| Category | Description |
|---|---|
| Search | Finding information through keyword search. |
| Links | Connects information into a meaningful ecosystem using the model of the Web and provides low-barrier social tools. |
| Authoring | The ability to create and update content leads to the collaborative work of multiple authors. |
| Tags | Users categorize content by adding their own descriptive tags, which are short, one or two word descriptions. Tags facilitate searching based on what Website users believe the sites represent rather than by capturing developers' views. Collections of tags created by multiple users are called folksonomies (short for folk taxonomies). |
| Extensions | Extension software provides additional capabilities to Web browsers and allows more than just HTML documents to be used. It essentially makes the Web an application platform as well as a document server. |
| Signals | Syndication technology enables material to be broadcast to multiple Websites and to notify consumers when new material appears. |

After a period of popularity, Tim Berners-Lee, World Wide Web inventor, challenged the term Web 2.0 and suggested it is a *piece of jargon* because the Web is operating the way he had originally envisioned (Berners-Lee, Cailliau, Luotonen, Nielsen, & Secret, 1994). He called the Web "a collaborative medium, a place where we all meet and read and write" (Laningham, 2006).

Our investigation revealed that courses using the term *Web 2.0* occurred less frequently than those specifically mentioning social media and social networking. Further, a large proportion of these courses were oriented toward directly pragmatic and developmental aspects of Web 2.0, such as programming. These findings suggest the term *Web 2.0* is used in instructional practice as an enabling technology rather than a phenomenon. It also suggests that course descriptions using this term appeared relatively early in the move to provide social media education.

Altogether, the findings indicate that a number of universities are working toward the inclusion of social media material in their curricula. While this does not definitively mean social media is here to stay, it does indicate that many universities are devoting resources to its establishment in their courses. Furthermore, they are investing in both the technology to produce it as well as the social phenomena surrounding it. As such, it behooves academics in business departments to investigate how they may best deliver this increasingly important content and consider adding their own material on the subject in the near future.

## Approaches to Course Development

The remainder of this article focuses on specific courses offered at three major AACSB-accredited university business schools and the lessons learned during implementation. In all three examples AACSB mandates were put into practice using a recommended 'systematic process' for developing information systems competence in business.

Any social media course must have a sound pedagogy for its base regardless of delivery approach and underlying learning theories that provide a philosophy. Teaching method is important but

efforts must also focus on the content. As a mechanism for accomplishing this, an approach used to develop a set of learning objectives for teaching business ethics was adopted from Kidwell, Fisher, Braun, and Swanson (2013).

Kidwell et al. (2013) suggests that learning objectives should be based upon Bloom's Taxonomy, a classificatory model in use for over 50 years in the development of curricula. Bloom's Taxonomy inherently builds more complex components upon simpler ones. This lends itself to a situation where beginning concepts can be introduced via instructivism-based pedagogy (McHaney, 2011), intermediate concepts relate to constructivism-based pedagogies (Brandt, 1997), and finally, in our case, students leave the course with a connectivist mindset (Siemens, 2005). Bloom's Taxonomy (Bloom, Engelhart, & Furst, 1956) is well-established and has been used in numerous fields to describe how new behaviors can result through the process of learning. The Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths, and Wittrock (2001) model was updated in 2001, and that version was used for this article. This taxonomy has been used in a wide variety of business education related venues (Kidwell et al., 2013). Among these are accounting (Baker, Simon, & Bazeli, 1987), information systems (Harper & Harder, 2009; Mohtashami & Scher, 2000), human resources (Knight, 2013), and others (Warren, 1992).

The effective application of Bloom's Taxonomy is apparent when organizing topics and teaching pedagogies for learners exploring social media for business. By teaching fundamental concepts first, the learner becomes accustomed to the field of study and then can "develop and become integrated with other behaviors to form more complex behavior which is classified in a different way" (Bloom et al., 1956; Kidwell et al., 2013). As pointed out by Kidwell et al. (2013), the taxonomy is also well-suited for representing how pedagogies will be developed based on different learning theories. Kidwell's process included (1) identifying stages for developing subject matter competence; (2) aligning these stages with Bloom's taxonomy; and (3) developing learning objectives to support the process. We utilized a series of stages for teaching social media and Web 2.0, and for student competence development. The hierarchical nature of these five stages for developing competencies is analogous to Bloom's Taxonomy and its levels of learning. The following sections describe each of Bloom's levels in brief detail (Anderson et al., 2001):

Remembering is the ability to retrieve, recall, or recognize information that has been committed to memory. Facts, definitions, patterns, procedures, and other structured information are typically associated with this level.

Understanding is characterized by the ability to derive meaning from various forms of information. Interpretations, classifications, summaries, inferences, comparisons, and explanations are all examples of a learner being able to make use of the material in this level.

Applying is being able to use knowledge to carry out a procedure in either related or new situations. Executing, implementing, changing substantial details, and still being able to perform a task characterizes this level. Applying can be carried out using models, interviews, simulations, and other approaches.

Analyzing is being able to break the big picture into its components and then being able to determine how those components interact and interrelate. This activity includes mental actions such as organizing, attributing, and differentiating as well as distinguishing among fact, opinions, and hypotheses. Applications can use surveys, spreadsheets, diagrams, charts, or symbolic representations.

Evaluating is the process of making judgments based on criteria, prior experience and standards. Critiques, checks, inspections, recommendations, and reports are related to evaluation. These mental actions require determining value and include the capacity to compare with known standards.

Creating, a high-level activity, involves constructing a whole from various elements. The goal here is to form a functional whole. Other related activities include reorganizing elements into new patterns, creating new structures, producing a new product or element, or inventing. Creating can involve synthesis.

In addition to levels indicated by Bloom's Taxonomy, learning, as defined by connectivist thinkers, can extend beyond the individual (Siemens, 2005). Learners become nodes on a community of networks which include people, information sources, and other resources. Individuals learn as community expertise is acquired. Connectivism empowers a community of learners and extends knowledge by proxy as participants become experts with *know-where*. For this reason, the modified version of Bloom's Taxonomy shows an additional level, *networking*, to represent connectivist-learning, natural to those working in the realm of social media

Networking moves beyond individual actions and requires activities related to connecting nodes that have been created, co-created, or discovered by the learner (Siemens, 2005). In networking learning becomes a community effort and knowledge is housed at both individual and community levels. New digital tools enabling the formation of online communities produce this higher level of learning.

Illustrating the five stages provides insight into methods for teaching in this area (Kidwell et al., 2013). *Stage 1: Enhancing social media for business knowledge* can be compared to the first two levels of Bloom's Taxonomy, remembering and understanding. *Stage 2: Developing skills for social media for business* is the first level of application where students begin to recognize that deeper aspects of the topic are present. Understanding begins to emerge. *Stage 3: Improving abilities to use social media for business* involves the processes of applying and analyzing. *Stage 4: Maintaining an ongoing ability to acquire and create new knowledge and skills relating to social media for business* requires evaluating their learning and beginning to use it in knowledge creation. *Stage 5: Extending knowledge as intelligent nodes while community expertise is acquired with regard to social media and Web 2.0 for business* emphasizes the need for lifelong learning and the ability to network with other knowledge creators. Social media has the ability to extend knowledge and help users to function as intelligent nodes. Community expertise is acquired with regard to subject matter, and social media enables the premise that *"learning is no longer an internal, individualistic activity."* Networking and information exchange are essential (Siemens, 2005). Table 2 provides Bloom's Taxonomy with an added network stage and further illustrates the stages used in course development.

**Table 2: Bloom's revised taxonomy mapped to general learning objectives**

| Stage in Bloom's Revised Taxonomy | Stages for Competence |
|---|---|
| Remember | 1. Enhancing |
| Understand | 1. Enhancing |
| Apply | 2. Developing |
| Analyze | 3. Improving |
| Evaluate | 4. Maintaining |
| Create | 4. Maintaining |
| Network | 5. Extending |

## Specific Implementation Examples

Approaches to course development were explored further through an examination of social media courses offered by this article's authors. All three of these courses utilized approaches that followed the 'stages for competence' described in Table 2. Early material was definitional and was eventually moved into creative phases where social media use was fostered with a constructivist mindset. End goals for the courses included making sure each student possessed understanding of how to acquire information regarding social media applications through a network of nodes as a connectivist (Siemens, 2005). Details regarding the three specific classes follow.

### University #1

Example #1, entitled *Social Media,* was a seven-week undergraduate course offered at a major East Coast U.S. university and was 100% online. The focus of this course was on standard Web 2.0 and Social Media topics such as blogs, wikis and podcasts, Facebook, LinkedIn and Twitter. In addition, students learned about powerful and useful Web 2.0 cloud-based tools such as Jing, Dropbox, Feedly, SoundCloud, Evernote and others. Students were challenged on issues such as privacy, whether or not social media was "good or bad" for our society, and, as Sherry Turkle (2011) put it, the new phenomenon in which we are "alone together." Three textbooks were used for the course: Web 2.0 and Social Media for Business by McHaney (2013), Social Networking 2nd Edition by Miller (2013) and Web 2.0 Concepts and Applications by Shelly and Frydenberg (2011). Students who attended this class came from all parts of the university; they were business majors, communication majors, drama and theatre majors, nursing students, psychology majors, and others. Some of them came into the class with prior expertise in social media. When asked, they talked about their significant familiarity with Facebook, Twitter, LinkedIn, Instagram, and Pinterest. Some, however, professed a distinct ignorance of the details. They knew that social media was out there, and they thought that they should know more about it and should be using it, but were not quite sure where to start. Many expressed concerns about how it all worked or what role social media could (or should) play in their lives. The course itself has been offered twice each semester since Fall 2012 with a cap of 25 students, and it was filled immediately. Activities for the course included reading articles, watching videos, taking quizzes, submitting papers, and participating in a discussion board each week. Students had a set amount of work to do each week; they chose the timing of when to complete the work and submit their assignments, but all work was submitted on a weekly basis.

### University #2

Example #2, entitled *Web 2.0 and Social Media Management*, was a 10-week (summer) graduate course offered at a major southern U.S. university and was 100% online. The focus of this course was Web 2.0 technologies, not only as course content but also as course infrastructure to increase student-to-student and professor-to-student interaction (Doring, Hodge, & Heo, 2014). The primary topics covered were social media, online tools, social networks (including Twitter and Facebook), wikis, and blogs. Course material comprised information from the book *Web 2.0: Concepts and Applications* (Shelly & Frydenberg, 2011), informative videos pertaining to social media, and other online tools, including social networks, wikis, and blogs. Students in this course were primarily business students (all majors), but also included were some Public Administration and Political Science students. Activities and assignments for the course were based both on individual and group work and utilized Web 2.0 technologies such as Google Docs and Microsoft SkyDrive (now renamed "OneDrive"). The course used social media to teach social media and added class discussion, assignments, and tests online. Instructors discussed collaboration theory and then put it into practice for a variety of projects using social media tools. Assignments included: comparing different blogs and blogging platforms; discussing the reliability of cloud computing; contrasting benefits and weaknesses of crowdsourcing; assessing whether social net-

working is a fad or paradigm shift; viewing, analyzing, and discussing videos pertaining to Web 2.0 technologies; determining the value of social media used by political candidates and business officials; discussing mobile technologies; and evaluating the risk and threats of Web 2.0 technologies in business. Items from industry press played an important role in this course.

Researchers have pointed out that some distance courses are less effective because of the "lack of prompt feedback, ambiguous instructions on the Web, and technical problems" (Hara & Kling, 1999). To mitigate this, the primary media used to facilitate discussion in this course were Twitter, Facebook, and a built-in university discussion board. The instructors described Twitter from a business perspective, then provided an example in class. Instructors continually informed students regarding current events and other information pertaining to the course. This provided a sense of how business could use this technology. Facebook groups provided another example of using social media to teach social media. Within this context students posted questions and created discussion topics. This approach facilitated prompt feedback from classroom peers as well as the professor and teaching assistants. This provided an invaluable way for clarifying class issues, highlighting and discussing major current events related to the use of social media in organizations, and gathering additional responses. Many students were already familiar with the organization and structure of Facebook, and this lowered the learning curve.

### *University #3*

Example #3, entitled *Digital Business,* was a 16-week undergraduate course offered at a major Midwestern U.S. university and was hybrid with some online and some face-to-face sessions. The course focused on five major, interrelated components: social computing, social media, content sharing, filtering, and Web applications. These components were explored within the context of business application and new business development. The premise of the class was that modern business faces an emerging digital environment largely shaped by forces outside its control. Two of these forces, Web 2.0 and the arrival of tech-savvy Millennials, demand that managers and planners reconsider approaches to computing, communication, marketing, data management, accounting/finance, purchasing, selling, and nearly all other aspects of business. This course explored an emerging set of technologies without sacrificing proven business practices. Additionally, it provided students with a solid foundation for the digital environment they are likely to encounter in their future careers. This course used Web 2.0 and Social Media for Business by McHaney (2013) as the textbook. While the course was primarily intended for business students, many of those who were enrolled were from other disciplines, including computer science, engineering, human ecology, agriculture, and areas where specific business or entrepreneurial interests exist.

This course included activities that introduced students to the topics dynamically in a business context and provided practical development experience through projects, exams and assignments. Students were expected to understand and appreciate the business impact of Web 2.0 technologies including social computing, social media, content sharing, filtering/recommendations, and Web applications; to demonstrate proficiency in the use of blogs, wikis, podcasts, social tagging, and new Web 2.0 applications; to become familiar with emerging online business tools and gain proficiency in their use; and to conduct research on social media tools and their applications.

The course helped entrepreneurs and business people explore how today's consumers are different and to understand how to interact within digital environments. This course examined a number of important technologies that have converged to enable business transformation. Among these were networked computer systems, content development tools, online office suites, new application programs, and mobile smart devices. Additionally, the vast free information resources that have reshaped how knowledge is stored and communicated were examined in detail. Business use of these resources was emphasized. This course also examined information nodes which

form the basis for personal learning networks and change the way people work and interact. Social bookmarking and tagging tools created to filter, sort, and find what is needed were explored in order to use this emerging information effectively.

### *Quality and Student Feedback*

All three courses were well-accepted by students. Activities were treated with enthusiasm, assignments were generally completed with high quality, and student interest was high. Discussion threads were active and used frequently by students. Additionally, students provided positive feedback regarding the courses both in class evaluation forms and in personal messages in social media venues.

To illustrate, students from the example universities were asked to complete a feedback form at the end of each class in which they had the opportunity to reflect on what they had learned, what they took away from the class, and what might have made it better. Their comments and suggestions have been incorporated into future iterations of the classes. Sample comments follow.

> "This is my first time using social media through this medium. Let me first comment on Flickr. It is a very creative and useful site. I couldn't believe the fact that it can allow you to store up to one terabyte of memory all for free. I am going to be using this site to back up some of my photos. It will also be great to share photos with my friends and family. I hope to print some photos with one of Flickr's affiliates. As for Delicious, at first I thought it would just be same old book marking, but I was wrong. It can be accessed from multiple devices, which makes things a lot easier. I can also find things and share them with my friends. These are very powerful tools. I just wished that I had signed up to learn about them a lot earlier as some of my peers did. Now I see what all the fuss is about. I am glad that this course exposed me to it."
>
> "I thoroughly enjoyed this course. I thought I understood everything about the world of social media but I was wrong. It was interesting to find out more about blogs and wikis and I liked learning about Pod Cast. I always wanted to have a blog but never felt like I had time to start one, but thanks to this course I know how to effectively manage my own blog. My favorite new social media venture to use is Delicious. It will help me keep track of things that I like and wanted to read about on the web but may not have time to at the moment. It's a way to keep me from procrastinating and working more effectively."
>
> "I am really glad I decided to take this course, especially because of my chosen field. I was really impressed with how useful some of the sites I had never used before were. I honestly didn't think there was a point to sites like Flickr and Delicious, but I find that I am still using them for personal use. I also enjoyed learning about what goes into social media sites and how they are able to connect us. I've never really thought about all that goes into making social media sites like these and how they work. I also learned new things about sites I use often like Twitter, which I can use now."
>
> "I think this course covered everything that I was expecting, which makes me very happy. I don't think there was anything more that this course needed to make it better. I think that this class has the ability to benefit anyone. I can definitely say that it has given me a lot more confidence knowing that I am now aware and somewhat experienced with the material and social networking sites that I will most likely be using in my future. Before this course, I was not aware about almost half of the material we covered. This made me nervous because I am majoring in communications and feel that I needed to familiarize myself with the various forms of social media that are out there today. I got everything out of this course that I wanted to and I couldn't be happier that I had the opportunity to take it."

> "This course provided hands on experience in developing social media applications. I learned that Facebook is more than a way to contact my friends and family. This experience opened my eyes to what business needs to do with social media."

# Discussion and Implications

Web 2.0 and social media technologies are currently transforming the business world (Kaplan & Haenlein, 2010) and having an impact on teaching and learning. As mentioned earlier in this article, business schools will be at risk of losing relevance unless changes are made to course content, supplemental materials, and resources as technologies modernize and impact strategic approaches to conducting business. This fact was brought into clear focus following our initial investigation into approaches being used to teach social media at AASCB-accredited business schools. Our study revealed that approximately 19% of these schools had programs specifically offering social media courses. This number rose to about 22% when other related topics such as Web 2.0 were included. This represents a recognition that social media is gaining traction in business education but also indicates a great deal of work remains. We believe there may be several reasons for the low rate of implementation. First, social media is a relatively new Internet phenomenon and, if the past is an indicator, it might be viewed by some as a fad. While we do not believe this to be the case, many others might be taking a 'wait and see' approach. Another reason might be due to the fact that business school curricula often have little room for new course work. AASCB requirements are stringent and may not allow the addition of extra course work without impacting graduation timelines. Finally, based on our research, we believe there may be a question as to what department or functional area is best suited for teaching social media. As reported earlier, we found evidence of social media minors and social media courses in areas other than IS. Arguments can be made for these topics to reside in marketing, MIS, management, and other places within business and in other non-business areas such as journalism, computer science, and anthropology.

A major implication of this study was that no clear approach appeared to be the norm in teaching social media. For this reason we focused on specific courses offered at three major AACSB-accredited university business schools and investigated their implementation processes. In all three examples AACSB mandates were considered and used to guide systematic methods for enhancing information systems competence in business. The instructors from the three courses organized their collected knowledge according to 5 stages which generally correspond to levels in Bloom's Taxonomy. The stages were used to indicate which pedagogies should be considered at various points in the course implementation process. This process has been followed in curricula areas other than social media to construct approaches to offering new coursework (Anderson et al., 2001; Kidwell et al., 2013). This approach provided an organized way to scaffold learning and move students from merely recognizing terminology to being able to actively participate and contribute to smart business use of social media. A number of implications are pertinent at each stage.

*Stage 1: Enhancing social media for business knowledge:* Any education effort requires understanding a topic area's common language and accepted practices. The three university courses reviewed in this article engaged in *remembering* and *understanding* in a variety of forms. In all three courses examined a general set of background material was provided to the students. Although today's students have been called digital natives and many are considered tech-savvy Millennials, there is a large difference between casual technology use for friendly social interaction and technology use for business. Students required a firm base of knowledge that explained how Web 2.0 concepts emerged, what defined social media, how Web 2.0 and social media systems worked, and how technology has evolved. These concepts were offered through the use of standard textbooks, online tools like flashcards, and PowerPoint lectures. The course instructors felt

that the students still required this background source material to provide an even footing for deeper understanding. Furthermore, *understanding* in the three courses was characterized by the ability to derive meaning from various forms of information. As pointed out in the example case of University #2, industry press was a helpful application. Academic literature may be a year or more behind in terms of the latest trends due to the rapid speed of social media evolution. Basic concepts and fundamentals of social media and Web 2.0 can generally be covered academically; however, the latest trends and new product information may be difficult or impossible to locate. Use of industry press helped overcome these issues. The lack of refinement in information from these sources may be an acceptable cost in exchange for exposing students to it earlier. Indeed, the industry press often takes hard-learned, practical lessons into account, giving students anecdotal information about the proper and improper use of social media and new technologies that surround it. Students appreciated the aspect of realism and reported greater understanding regarding how social media could be used strategically and differently in business settings. In addition, the course instructors conducted discussions to help in developing a basic understanding of the topics. Students asked questions using social media, such as discussion boards, to ensure their comprehension went deeper than merely remembering.

*Stage 2: Developing skills for social media for business*: The three courses reviewed all enhanced student skill sets in basic social media use. The corresponding Bloom's level, *applying*, was implemented in these example courses by ensuring that students were able to use knowledge to carry out business-related social media tasks in new situations. This stage's activity was important to the success of the classes because it required hands-on experience using social media software, models, simulations, and other approaches. It was certainly true that some students came into these classes being familiar with one or more social media platforms such as Facebook, Twitter, or Instagram. However, students still had much to learn about business applications and other social media areas that they did not regularly use, such as LinkedIn. Instructors in the three courses reported that familiarity with common tools did not instantly translate into more sophisticated expertise. The basis for using social media was substantially different. For example, sending out Tweets on a personal account is vastly different from developing a social media strategy and then carrying out a directed campaign using multiple, coordinated tools. Additionally, another implication of teaching in the 'applying' area is that both students and instructors needed to be aware that no guarantee exists for any particular social media tool to remain dominant indefinitely. Consequently, we found it important that coursework emphasized tool diversity in order to gain a better understanding of social media systems in general as opposed to mastery of one or two platforms that may become obsolete with the rapid changes in technology. This also helped prevent students from over-familiarizing themselves with one company's systems to the extent that they become inflexible.

*Stage 3: Improving abilities to use social media for business.* After mastering basic tool use, analyzing business needs through a social media lens helped students step back from using specific tools and look at functions from a strategic standpoint. During this stage students began to move into deeper learning as they broke the big picture into components and then determined how those components interacted and interrelated. We found that an instructor should encourage students to analyze various social media tool functions and select the appropriate application to achieve a particular business goal. Using this approach gave the instructors a sense that application of a variety of tools through usage is a key element of any social media course. Technical support can put analyzing into practice. We found this was a role that instructors ended up playing whether they wished to or not. Myriad new technologies made support and debugging applications a time consuming activity. We encouraged students to use existing online community resources to help analyze problems and to interact through message boards and other online forums. We found this helped develop analysis skills. It was also helpful to us as instructors to expect to provide help and offer "fast start" tutorials. In some cases we had to work with the university's IT support de-

partment in order to determine where and when to refer students to helpdesks and other campus resources. Additionally, the incorporation of social media use for help functions can be used to motivate participation, facilitate collaboration, and provide prompt feedback. Information from the three courses reviewed for this article revealed that students were highly motivated to use social media for projects and course work completion and to help their peers. Some students who had never used these technologies previously realized the benefit they could bring to other aspects of their lives and careers. As educators increasingly turn to social media to communicate with their students (Moran, Seaman, & Tinti-Kane, 2011), the benefits of its use in teaching become more salient, and, as such, it is important to introduce its utility through instruction and example.

*Stage 4: Maintaining an ongoing ability to acquire and create new knowledge and skills relating to social media for business.* There is no doubt that social media will continue to change. It became important in all three example classes to enhance student abilities to update and maintain their skills. The Bloom's level of evaluating focuses on the process of making judgments based on criteria, prior experience and standards. Students in the three university courses completed critiques, checks, inspections, recommendations, and reports to better understand how social media was being used effectively in business settings. Among items used by instructors in this area were tools for measuring social buzz such as *social mention*, *mention.net* and *Klout.com*. These tools were used to evaluate the effectiveness of social media campaigns. Students were required to determine value of social buzz and developed benchmarks to compare outcomes with actions taken (e.g., retweets, media mentions, and positive reviews). An implication noticed during the evaluation level was that the very nature of social media courses made them susceptible to a potential pitfall – an inherent instability as a learning platform. New technologies are developed all the time, particularly as Web site integration becomes more complete. Many unanticipated permutations became possible, even for novices (e.g., Facebook apps, rule changes, and various browser extensions). Many of technologies were found to be applicable to social media or directly connected to major social media services. We believe it imperative that a social media instructor not be enamored with the plethora of options but rather pay attention to the strategic implementation of social media and then understand whether goals were achieved. Covering too many technologies meant only a few could be covered well. An additional complication was that instructional materials have a very short shelf-life, becoming obsolete quickly. We found one way to provide both breadth and depth to these social media courses was to encourage students to conduct evaluations of available tools in a particular category and then focus on a particular one for in-depth application. Online learning resources such as MOOCs, tutorials, and so forth were used to keep skills up-to-date.

Additionally, this stage (Bloom's level of *creating*) involved constructing a social media campaign from various elements. All three example courses included elements where the goal was to form a functional whole. General activities included understanding the social media environment then using new knowledge to reorganize elements into new patterns. For example, students created blogs, then sent out related tweets through Facebook business pages. In other instances they constructed online articles, websites, or rolled out embedded widgets. Additionally, *creating* can involve synthesis from a variety of social media platforms. In all three courses students suggested that working through social media development projects helped them acquire new capabilities or improve existing abilities.

*Stage 5: Extending knowledge as intelligent nodes while community expertise is acquired with regard to social media and Web 2.0 for business*. Information resides in networks. One implication for this new reality is that learning has begun to move beyond individual actions. Students had to find ways to connect to nodes that were created, co-created, or discovered by themselves or their peers. The consequences were far-reaching and opened new venues for acquiring knowledge. For instance, the goal became preparing students for post-classroom success where

they would need to find reliable information in their domain areas. New digital tools assisted the formation of online communities and enabled this higher level of learning. Students found online forums, discovered better ways to search for reliable information, and learned how sharing resources could lead to better outcomes. Web sites such as SlideShare, DocStoc, Flickr, Wikipedia, and others were used to illustrate the concept of self-regulating communities and their value to business. This level was relevant and needed in a social media environment even though it is not part of Bloom's taxonomy (Siemens, 2005). The central premise of networking was extending knowledge as intelligent nodes while community expertise was acquired. Students experienced, joined, and contributed to communities of practice using the processes described in this article. This enabled them to understand how knowledge can be housed outside the individual according to connectivist ideas and helped them become part of the knowledge infrastructure developing across the globe. This doesn't mean that traditional communication should not be used. In fact, coursework such as this often required a step back into traditional technology.

Social media platforms, including Facebook, Twitter, LinkedIn, Flickr, YouTube, Instagram, Pinterest, and numerous others, have begun to revolutionize the way businesses view customers, clients, potential clients, employees, external stakeholders, and others (Dunlap & Lowenthal, 2009). In fact Web 2.0 concepts and social media have transformed Internet use from an informational platform into a communication and interaction platform. Business schools cannot afford to ignore the vast changes these technologies have brought and must use a combination of learning theory applications, skills, knowledge, and expertise to prepare students for the future (Roebuck, Siha, & Bell, 2013). Table 3 summarizes takeaways for each stage in the process of making this happen.

**Table 3: Key Takeaways from Stages for Teaching Social Media**

| Stage | Key Activities | Key Social Media Technologies |
|---|---|---|
| *Stage 1: Enhancing social media for business knowledge* | Learning required background. | Online resources; Textbooks; Websites; Wikipedia; PowerPoint; Online Lectures; E-Flashcards; E-Books |
| *Stage 2: Developing skills for social media for business* | Using social media tools. | Twitter; Facebook; LinkedIn; Blogs; Websites; Instagram; YouTube; Other social media sites |
| *Stage 3: Improving abilities to use social media for business* | Integrating and using social media for business purposes. | Social media campaigns consisting of combinations of tools such as Blogs, Facebook Business Pages; LinkedIn Business Features; Review Sites; Media Sites |
| *Stage 4: Maintaining an ongoing ability to acquire and create new knowledge and skills relating to social media for business* | Learning how to acquire social media skills as tools change, and how to create online artifacts. | Online learning resources; MOOCs; Tutorials; Klout; mention.net; New apps |
| *Stage 5: Extending knowledge as intelligent nodes while community expertise is acquired with regard to social media and Web 2.0 for business* | Learning how to become an active part of the growing information infrastructure. | Flickr; DocStoc; SlideShare; Animoto; GoAnimate; Camtasia; Other tools that permit sharing of resources |

# Conclusion

This study provides a strong recommendation that business schools offer social media courses. This recommendation is informed by two primary sources. First, business practices are altering the way they connect with customers and other stakeholders through social media implementations. This change is dramatic and rapid as more companies incorporate related goals into their strategic planning and use tools provided by vendors such as Facebook, LinkedIn, Twitter, WordPress, and others. Second, Standard 15 of the AACSB (2013) suggests a systematic process for curriculum management which covers skill areas such as the use of information technology that "influence[s] the structure and processes of organizations and economies and influence[s] the roles and techniques of management." The authors believe the current impacts of social media and Web 2.0 technologies certainly meet this criteria and must be considered in future curriculum updates. There is little doubt that the adoption of social media tools has completely altered communication strategies for industries, government, individuals, and universities. Technologies such as Facebook, Twitter, YouTube, and Google+ can be incorporated effectively or ineffectively into these environments. In the corporate world correct usage of these services may lead to product promotion or brand name recognition, whereas incorrect usage may lead to a damaged name and reputation. Although businesses are embracing these technologies (71% of large corporations), only 22% of AACSB accredited schools of business are teaching the topic and only 39% are incorporating their own use of social media due to concerns related to bandwidth drain, security or privacy intrusion, extraordinary expense to support, or lack of benefits (Case & King, 2011).

Our primary goal for this article was to provide both motivating factors and practical implementation suggestions for teaching social media in a business school. To accomplish this we first provided a sense of how many business schools were offering coursework in the area of social media. During that phase of our study we found not many AACSB-accredited business programs appeared to be offering social media courses. Specifically, only 19.23% had programs with social media content. This number improved slightly more if the criteria was broadened to include related topics (22%). This low number indicates much work remains to be done. Second, we offered a methodology for creating new social media courses using the experience and best practices of three implementations. Background information was collected through a review of three specific university courses that effectively applied Bloom's Taxonomy to organize topics and teaching pedagogies for learners engaged in exploring social media in business. The idea that complex learning was constructed from simpler components was illustrated through an adaptation of Kidwell's course development process (Kidwell et al., 2013) which included (1) identifying stages for developing subject matter competence; (2) aligning these stages with Bloom's taxonomy; and (3) developing learning objectives to support the process. Similarly to Kidwell, we utilized a series of stages for teaching social media analogous to Bloom's Taxonomy and added a level representing connectivist thinking which characterized new media and online social networking. This illustrated the concept that learning can extend beyond the individual (Siemens, 2005). We believe that teaching social networking effectively requires that learners become nodes in a community and extend their knowledge by proxy as participants become experts with *know-where*. The stages illustrated in our recommended course development were informed by three example courses currently offered at AACSB-accredited universities.

## *Limitations and Future Directions*

This study has its limitations. For instance, when researching college catalogs for evidence of social media courses and programs, we could use only publically accessible material. A publication delay often exists as new courses are trialed and added to the formal listing later. Additionally we provided a detailed analysis of 3 social media courses at major universities. This is in no way exhaustive nor the only possible approache to teaching in this area. Other alternatives exist

which could be explored in more detail in future studies. Likewise, our adaptation of Kidwell et al. (2013) was useful for our AACSB-accredited universities but may not apply equally well to universities with different learning objectives and criteria. Even with these limitations, the current study provides insight on social media courses and teaching in business colleges. Since there is limited research regarding this topic, we feel that this study contributes to the literature in this area.

Educators and scholars alike would benefit from additional work examining social media as both a tool and a subject of study. Examining the relationship of social media and its use by other majors/departments would extend this study. As described earlier, a variety of programs outside of IT-oriented disciplines embrace social media in their subject matter. Investigations into these trends may help understand the linkage between social media and other disciplines. Examining its spread would also provide an interesting example of a technology that can be used as a teaching tool in itself, helping to understand both the instruction of IS subjects as well as the adoption of a prolific IS artifact.

Evaluating learning content acceptance with models such as the Content Acceptance Model (Barelka, Jeyaraj, & Walinski, 2013) may help provide a more thorough understanding of related phenomena to encourage students to embrace online education and aid online educators in engaging their pupils. Additionally, surveying instructors directly to see how they view and use social media and whether they include it in their courses may illuminate current practical uses of social media in education as well as its status as a subject of instruction. Such a study may also provide further benefit by allowing for comparative studies among faculty members in different departments. Better understanding of social media users in both business and education can provide further insights useful to adding elements to business curricula and aligning these with course learning objectives. Additional study is also needed to empirically test how the network element derived from connectivist theory aligns with levels of learning in Bloom's Taxonomy. Supporting theory for this area has not been fully developed.

## *Summary and Recommendations*

In spite of this study's limitations, we believe social media is a necessary topic in business schools. Its benefits certainly outweigh any uncertainties. Additionally, using social media to teach social media is beneficial as it increases collaboration and awareness among students and faculty in a number of ways. Since prior research has suggested no significant difference exists in learning between distance education and traditional face-to-face approaches (Tucker, 2001; Wagner, Garippo, & Lovaas, 2011) and since online learning is gaining momentum (Dykman & Davis, 2008), we found social media facilitated the collaboration among geographically dispersed students (Ralph & Ralph, 2013). We believe social use of new media tools exposed our students to new capabilities and promoted interpersonal communication. Adding a business focus to this knowledge resulted in improved abilities and new venues for personal development. Instructors ensured that students left the courses with adaptable knowledge that allowed them to maintain new skills as well as acquire/create new insights. Other lessons-learned are summarized by category:

*Course Projects*: Students suggested that working through social media development projects helped them acquire new capabilities and improved existing abilities. It enabled them to see social media from a different and more professional perspective. The idea of developing social media use policies and thinking about the ramifications of sending out messages made a deep impression. Additionally, social use of tools promoted interpersonal communication aspects of classroom learning. Likewise, students were motivated to experience, join, and contribute to communities of practice and learning. Projects in the area of knowledge creation helped most students recognize how learning can become a lifelong asset.

*Curriculum Development*: Curriculum resources in this area are developing but not mature. Instructors of the exampled three courses used a variety of textbooks and other material and noted that course material has an extremely short shelf life. This makes industry press a valuable resource. Fundamentals are covered in the literature and in textbooks, while industry press can add realism and currency to a course. The instructors of the examined courses spent considerable time developing custom course material. A critical lesson was that it is important to select what to teach with care; poor choices decrease instructional value.

*Students*: Although students have been called digital natives and may be tech-savvy, a knowledge chasm existed between causal technology use for friendly social interaction and technology use for business. Likewise, students may already have been very familiar with one or more applications but few had used all tools in sophisticated ways. That being said, most class participants enjoyed using social media and were highly motivated to learn new tools and techniques. Another important comment by an instructor was to remember to stay involved with the class, support the students, and remain in contact with them through social media.

*Teacher Concerns*: Among issues mentioned by instructors of the exampled courses was a lack of time. This was particularly true in distance learning venues. A lack of face-to-face communication and ways to ensure undivided student attention led to participant procrastination as well as thrown-together or highly-unbalanced collaborative projects. Instructor involvement in the course work and using techniques such as requiring regular status reports helped mitigate this problem to some degree. Instructors also suggested that if you try to teach everything, nothing will be taught well. Do not assume that "rapidly evolving" technology can be set up in a short time, especially when relying on many disconnected individuals. Do not without warning make changes mid-semester to incorporate new technology.

*Teaching Techniques*: Instructors and students often learned together since the course work included exploring new tools. The idea of co-learning emerged and provided an excellent venue where the enthusiasm and experience of students could be tempered and mentored into relevant business space by the instructors. In other examples, social media worked well as both a teaching tool and subject. For instance, a class Twitter feed demonstrated useful communication features that would translate directly to the business world. Other helpful teaching advice included that instructors found networking via telephone contact provided a sense of comfort and value, particularly for less advanced students in online course sections. Media Richness Theory (Daft & Lengel, 1984) may describe why engaging in real-time voice communication with students added a level of concreteness to the course. Other forms of real-time communication, such as the use of chat services, were also beneficial in this regard. Another strategy that worked well was to hold an introductory, on-campus "class meeting" so students and instructors familiarized themselves with one another to some extent. However, not all students were able to attend, and instructors had to plan for this, with class members joining the meeting with real-time video (e.g., Skype). In a similar way, it is worth holding online "study sessions" with built-in chat facilities to connect instructors and students. Furthermore, this offered an advantage that traditional lectures do not in the form of logged conversations for future reference.

*Tools and Online Resources*: Potential challenges to teaching social media come from the very medium itself. This is particularly true if distance learning delivery is being used. For instance, several students did not have a Facebook account. They were concerned about privacy or a lack of security. Some did not want to share their account details with the class or instructor. In one of the courses examined, much of the discourse occurred on Facebook, causing discord in the discussion-participation component of the class. Another drawback was that many online tools simply disappeared. For instance, in one of the courses, a tool called Stickam was being used, and it simply ceased operation on a particular day with little warning. So, there is no guarantee that any social media tool or platform will remain viable (or free) indefinitely. Social media companies as

well as specific tools may disappear or be purchased and absorbed into another entity. The number of websites and tools used in the course must be carefully balanced to avoid over-complexity. Students should be exposed to more than one tool or type of social media but must also not be overwhelmed through the use of too many tools and websites. Instructors suggested not jumping on brand new, possibly transitory, technology at the expense of core concepts. Instead, use care not to be too rigid to add new developments to a course.

*Training Activities*: It is important to recognize that teaching social media has an inherent pitfall – the rapid evolution of its own technology. This means continual training is required and exercises developed for students need to be validated frequently. For this reason it becomes imperative that a social media instructor not get too carried away with the large number of available tool options. It is important to prevent students from over-familiarizing themselves with a tool to the extent that they become inflexible. Related to training, technical support was a role often taken on by instructors. We found that additional support may be necessary. University helpdesk services may help minimize problems in this area.

Taken in sum, this article provided both motivating factors and practical implementation suggestions for teaching social media in a business school. We believe our initial research examined how businesses are strategically using social media and provided an impetus for creating new courses. Further, the three examples of how major universities are approaching the current, broad technology changes sweeping through social and business milieus provided additional insight. The process of implementing these changes included offering courses that teach social media theory and application through the use of various Web 2.0 and social media platforms as described in the discussion. Bloom's Taxonomy adapted through Kidwell's, et al. (2013) example provided a framework for structuring learning. Likewise, this article promoted the idea of developing classroom experiences that provide lasting value through scaffolding for lifelong learning experiences. Students are able to form personal learning networks and become part of fast-paced, changing networks of information. Students and faculty continue to learn as community expertise is acquired and participants become experts with know-where (Siemens, 2005, p. 1). The development and delivery of new social media courses can achieve success with attention to the lessons-learned provided in this article.

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# Learning Circles: A Collaborative Technology-Mediated Peer-Teaching Workshop

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## Abstract

This research study explores peer teaching and learning without a domain expert teacher, within the context of an activity where teams of second level students (~16 years old) are required to create a learning experience for their peers. The study looks at how participants would like to be taught and how they would teach their peers if given the opportunity and examines the support they require, their motivation levels, and if they actually learn curriculum content using this approach.

An exploratory case study methodology was used, and the findings suggest that students want varied learning experiences that include many of the elements which would fall under the heading of 21st century learning, that with some support and encouragement they can create innovative learning experiences for their peers, and that they can learn curriculum content from the process.

**Keywords:** Collaborative Learning, Technology, Teamwork, Peer learning, Peer teaching, Project-based, Bridge21.

## Introduction

In a world in which vast amounts of information are easily available, (c.f. Wikipedia, YouTube, the Khan Academy, etc.) the notion of a teacher being a gate-keeper to content is meaningless, and the usefulness of a purely didactic approach to teaching and, indeed, the role of teaching itself need to be re-examined. The emergence of the "flipped classroom" (Gerstein, 2011) and experiments by Mitra and Dangwal (2010) on teaching without a teacher are just two examples of the type of innovation which is taking place.

In Ireland, secondary school education is divided into two main cycles. Students spend three years preparing for a state examination called the Junior Certificate and then a further two year "Senior Cycle" leading to the final secondary



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school exams, the Leaving Certificate. Students sitting the Junior Certificate are typically 15 years old. Many schools offer an additional year between the two cycles. This "Transition Year" is an in-school gap year where students often get the chance to study subjects outside the regular curriculum, to take part in community or professional work placements, and to participate in extra-curricular projects both in and out of school. The participants in this study were Transition Year students (~16 years of age) from seven schools in Dublin. For each workshop within the study, a mixed group of around 20 students, from four or five different schools, would work together for four days

This research study looks at learning without a domain expert teacher and peer learning by examining an activity where teams of students are required to create a learning experience for their peers, who were students of a similar age and year group.

Working in a purpose-designed learning space in the authors' university, and using a particular model of technology-mediated collaborative learning (Lawlor, Conneely, & Tangney, 2010), teams of Transition Year students were each given a topic from the Irish Second Level Senior Cycle curriculum, asked to learn it, then prompted to prepare a learning experience, on that topic for their peers. Adult mentors were present to support the process but were not subject experts in the topics being taught.

Four workshops took place, each of four days in duration. A total of 82 students participated in the study, and they worked on seven different curriculum topics across a range of subjects from biology to history. Following an exploratory case study methodology, data was collected from (1) student questionnaires, (2) student focus group interviews, (3) mentor interviews, and (4) analysis of the learning experiences created by the participants.

The study looks at how participants said they wanted to learn and how they would teach their peers and investigates the support they required to do this. The students motivation levels and if they actually learned any curriculum content using this approach were also examined. By exploring these questions, the authors sought to investigate the potential for this type of learning to be used in more formal educational settings.

# Background

Awareness of different learning styles can be valuable to both teachers and students. Students will better understand why certain approaches are being used and how they can benefit from them, and, in turn, teachers should recognise the mix of learning styles among their students and tailor their teaching style to account for this (Kovacic, 2004). If a student's preferred learning style is compatible with the teaching style of his teacher, he is likely to retain more information, achieve higher grades, and maintain a higher level of interest in a given subject (Felder, 1993). That is not to suggest that students should only be exposed to a single pedagogical approach but that some understanding of their preferred learning styles would be worthwhile in any lesson planning process.

The idea of the "flipped classroom", which involves assigning work to students in preparation for a class and then using the class time in a different way, is receiving attention in both the research literature and the popular media (Bergmann & Sams, 2012; Gerstein, 2011; Prensky, 2011; Tucker, 2012). Flipping is not a new idea though. Set reading to be covered before class has been a common teaching technique since the advent of the textbook. It is an approach that can be used for a variety of courses and grade levels. However, the widespread availability of technology, which allows for the creation and distribution of video and other media, has added an extra dimension to this approach. Teachers can create, or find, online material for their students to view, and use class time for discussion, problem-solving, or group-work. This allows the student to

work at their own pace, to repeat lessons if necessary and to take part in active learning during class time.

A prominent theme running through current research on technology-mediated learning is that the modern technology-rich classroom should include elements of constructivism, collaboration, problem solving, creativity, active learning, team teaching, and the creation of personally meaningful artefacts (Blatchford, Kutnick, Baines, & Galton, 2003; Galton, Hargreaves, & Pell, 2009; Johnson & Johnson, 1987; Jonassen, Peck, & Wilson 1999; Lou, Abrami, Spence, Poulsen, Chambers, & D'Apollonia, 1996; Harel & Papert, 1991; Poindexter, 2003). Constructivism focuses on the learner, rather than the teacher, and includes active learning, learning by "doing" and discovery-based learning - or in the words of Abbott and Ryan (2000), the focus is upon "knowledge construction and not knowledge absorption". Social constructivism emphasises the importance of interaction with others in the learning process, and Vygotsky's (1978) idea of the "more able other" is central to the approach.

A technique which explicitly addresses peers as "more able others" is peer teaching, in which students take on the role of teacher and students learn from each other (Goodlad & Hirst, 1990). It relies upon and strengthens the relationships between learners and can be, if properly structured, a powerful learning technique. In a peer teaching pedagogy, the role of the teacher is quite different from the more traditional model (King, 1993) and the term "orchestration" is used by Dillenbourg and Fischer (2007) to describe the teacher when acting as a facilitator conducting collaborative learning activities. The benefits to students of this approach are not just academic but also personal and social (Leung, Marsh, & Craven, 2009). P. A. Cohen, Kulik, and Kulik (1982) found that students who used peer tutoring performed better in examinations than control groups who had not used peer tutoring. Beasley (1997) claimed that a collaborative, student-centred, peer tutoring programme helped students who were "passive, teacher dependent, uncritical recipients of information" become more "engaged, questioning and autonomous learners". He also found that the benefits to the tutors included increased confidence, self-worth, and improved communication skills. Ng (2008) states that students involved in a peer learning project found the experience to be valuable and efficient. Goldschmid and Goldschmid (1976) argue that peer tutoring can benefit both the student "teacher" and the student "learner" by encouraging participation, cooperation, and social interaction. Knobe et al. (2010) claim that the benefits of a project involving self-teaching and peer teaching lie mostly with the student "teachers". Benware and Deci (1984) claim that learning for teaching creates high levels of motivation and that learning by teaching leads to excellent levels of retention.

Mitra and Dangwal (2010) took this idea much further and conducted studies into what children, working together but with no expert help, could learn using the internet as their primary source of information. They argue that children can learn what they want to learn, even without a specialist teacher, if given access to the information and encouragement to explore and work things out for themselves. This work reinforces the view that the traditional role of the teacher as the primary source of information for learners is changing and that how teachers work with their students may also have to change.

## *The Bridge21 Learning Model*

Since 2007, the authors have been engaged in a project which has developed a very particular model of ICT-mediated project-based learning (Tangney, Oldham, Conneely, Barrett, & Lawlor, 2009). The learning model involves moving away from a teacher-centred pedagogy and is designed to release the potential of student-led, collaborative, technology-mediated learning. The key features of the learning model are as follows. (See also Figure 1).

- "A structured **team-based** pedagogy influenced by the Patrol System learning method of the World Organisation of the Scout Movement (WOSM).
- A physical **learning space** designed and configured to support team-based learning.
- Adult support that seeks to **guide** and **mentor**, with teachers orchestrating and scaffolding team activities.
- Delivery of content through student-led **projects.**
- **Technology** used as an integral tool in the process.
- Incorporation of team and individual **reflection** as a regular part of the learning.
- **Cross-curricular thematic** learning." (Lawlor et al., 2010)

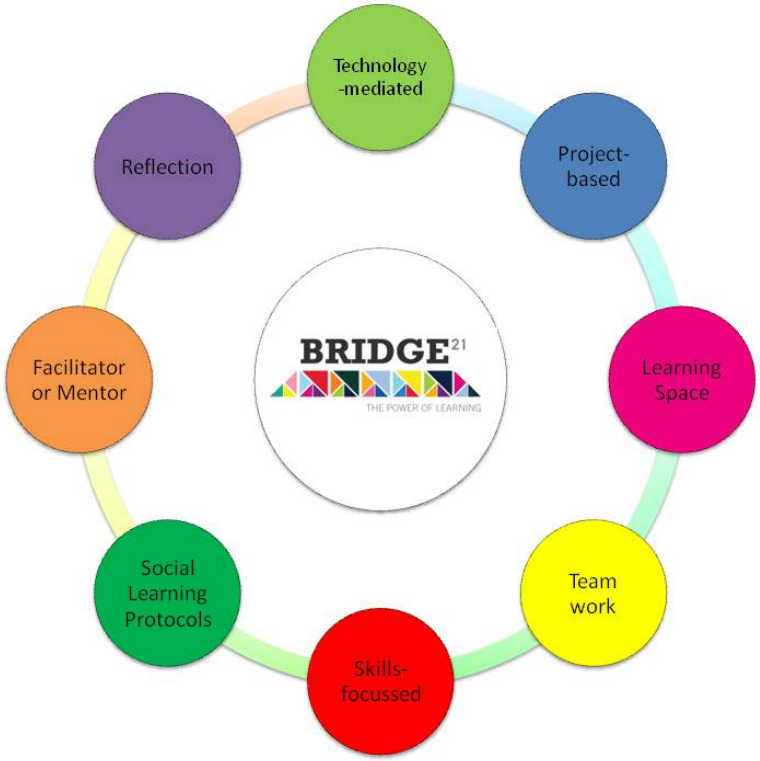


**Figure 1: The Bridge21 Learning Model – (Conneely, Lawlor &Tangney, 2015)**

Many of the individual elements of the model are well known and understood but the combination of these ideas, and especially their use within formal education, is something novel. In particular, the model of teamwork employed is heavily influenced by the World Scout Movement and its Patrol System. This involves fixed groups of young people with mixed ability and one young person acting as Patrol Leader. Bénard (2002) highlights mutual commitment, trust, and shared tasks or objectives as fundamental elements of the Patrol System. In the Bridge21 model, the team remains fixed over an extended period, and the members of the team must manage themselves, make decisions based on consensus, and assign roles. Much of the communication between the facilitator and the students is done through specifically appointed team leaders, who are elected by their team-mates. This structure, and the autonomy and flexibility it gives the team, encourages team bonding and helps foster a team spirit and identity. Bridge21 is the systematic assembly of well understood elements to create a pragmatic model for learning. It's heav-

ily team-based approach facilitates the transfer of responsibility for the learning to the learner. The model has been used with over 8000 students both within and outside the formal classroom and research to date suggests that it is very effective for promoting intrinsic student motivation, developing teamwork and twenty-first century (21C) skills (Conneely et al., 2015).

## *Research Focus*

The study focused on how students would like to be taught and how they would teach their peers if given the opportunity and examines the support they require, their motivation levels, and if they actually learn curriculum content using this approach. Specifically the following questions were addressed.

- What did students say about how they would like to learn?
- How did students teach each other?
- What support did students require in learning and teaching without a domain expert teacher?
- Were the students creating, delivering and attending peer learning sessions engaged and motivated to learn?
- Did students learn without a domain expert teacher?

# Research Design and Method

An exploratory case study methodology was used to explore a number of questions, as outlined in the introduction, centered on the idea of students as teachers and the use of peer teaching in a context in which access to digital content is freely available. The majority of the data collected for this study was qualitative, and this was supported by quantitative data collected by a pre- and post-experience attitudinal survey. The details of the workshops and the data collection instruments are outlined below.

## *The Learning Circles Workshops*

Four Learning Circles workshops, the central focus of the data collection, were carried out over a five week period using the Bridge21 model of learning. Each was 4 days in duration. There were roughly 20 students in each workshop (82 participants in total) and they were arranged into 4 or 5 teams (17 teams in total) – see Table 1. The students were randomly assigned across the four workshops and the teams were picked randomly, with the exceptions of trying to create teams that were neither single-gender nor full of students from one school. This is standard practice for a Bridge21 workshop.

**Table 1 Participants, Schools and Teams per workshop**

| Workshop | Students | Schools | Teams |
|---|---|---|---|
| **1** | 20 | 5 | 4 |
| **2** | 22 | 4 | 5 |
| **3** | 20 | 5 | 4 |
| **4** | 20 | 4 | 4 |
| **Total** | **82** | **7** | **17** |

The workshops took place on the main campus of the authors' institution and each ran for 5 hours per day over 4 consecutive days. The 82 participants were typically 15-16 years of age, and they came from 7 different schools, 5 of which are designated as "disadvantaged" in terms of socio-economic background and third level progression rates. There was a gender balance of approximately 50-50.

The participants in this study all had previous experience of working with Bridge21. This involved four-day workshops earlier in the same school year. The previous workshop focused on multimedia projects rather than any specific curriculum content. There was no explicit peer teaching element to that workshop but they did gain experience working in a structured team environment and using the technical resources in the Bridge21 learning space.

Initially, each team was asked to make a presentation on how they like to learn. This served three purposes. Firstly, it acted as both an ice-breaker and group formation exercise. Secondly, the presentations from each group give insights as to how such students would like to be taught. Finally, it was envisaged that this in turn would influence the main activity in the workshop.

The central project for each team was to take an assigned topic from their school curriculum, which they had not previously covered, to learn it for themselves, using the internet or other resources, and then prepare a 30 minute lesson on that topic. The workshop concluded with each team delivering their lesson to one other team, i.e., each team took a turn at being "teachers" and "students".

The physical learning space available consisted of 2 large rooms, one with team pods and the other a flat space equipped with a single PC, projector and large screen. Students worked in teams of 4 and, in keeping with the Bridge21 model of structured collaboration, each team was assigned a pod with two computers. There was no additional technology specifically introduced for the purposes of this project. Access to the internet as a primary source of subject information and the student's ability to use a range of software to assemble and present their ideas and information, and indeed to quickly learn how to use additional software, were the key technological components of this workshop.

Adult mentors were present in each workshop, 8 in total over the four workshops, typically 2-3 at any time, but none had any particular subject expertise in the topics that were assigned to teams to cover. The mentors were there to support and encourage the students, to help the teams to plan and make decisions together, and to help solve any problems that arose, whether these involved technology or personal issues within the teams. The topics were suggested by current second level teachers and were taken from the 5th and 6th year (Senior Cycle) of the national secondary school curriculum. They included mathematics (probability), history (the space race and the 1969 moon landing, Nazi propaganda), biology (the digestive system), physics (reflection and refraction of light), and geography (Brazil). To really stretch the model, the final subject covered was Mandarin which none of the participants, mentors, or researchers had any knowledge of. The topics were randomly assigned to the teams each week by the facilitator.

## Data collection instruments

Quantitative data was collected using closed questions on pre and post questionnaires, while qualitative data collection instruments included open questions on the pre and post questionnaires, semi-structured interviews with both the student participants and the mentors. Additionally, observation data, analysis of the student presentations, and lesson delivery was used. The complete list of instruments and the amount of data collected with each one is itemised in Table 2.

The pre questionnaire was designed to gather data on the participants' learning experience in school, and the post questionnaire was focused on their experience during the workshop. The pre

questionnaire included questions about which subjects the students preferred and why. There were also Likert scale questions including statements such as “I am bored in class”, “We work in groups” or “I work things out for myself”. A similar Likert scale appears in the post questionnaire to allow for a comparison of student experience in school and during the workshop. The post questionnaire also asked which parts of the workshop the students found the most difficult and whether knowing they would have to teach their peers was a motivating factor for them. The majority of the questions were taken or adapted from questionnaires used in previous Bridge21 workshops with some questions on student motivation added based on the work of Benware and Deci (1984). The student focus groups took place after the questionnaires and allowed the participants to further discuss their experience during the workshop. There were between two and four participants in each group, and in all but two of the focus groups the participants were from the same team. Questions about whether the participants believed they had learned by teaching, whether they believed they had taught their peers effectively, whether they had learned from their peers, and whether a peer teaching approach could be used in formal education were among the topics discussed.

**Table 2 Instrument used and participants in the study**

| Instrument | Purpose | Participants | N |
|---|---|---|---|
| Questionnaire | Pre and Post. Capture learning experience in school and after engaging with the model | Students | 73 |
| “How we like to learn” presentations (17) | Video of each presentation was viewed twice and the various teaching strategies discussed were identified. | Students | 82 (17 teams) |
| Student-led learning experiences (17). | Video of each learning experience was viewed twice and the various teaching strategies employed were identified.<br>The learning resources used by the teaching teams were also reviewed. This allowed for greater understanding of the teaching techniques used and gave some insight into the degree to which the teaching teams engaged with the subject material. | Students | 82 (17 teams) |
| Student focus-group interviews. (18) (52 students in total) | View and experiences of the model and the teaching strategies were captured | Students | 52 |
| Individual mentor interviews. | Mentor interviews took place subsequent to the final workshop, to facilitate triangulation. These brief interviews sought to further explore themes that emerged from other data sources. | Mentors | 2 |

## Data analysis

The qualitative data from both questionnaires and focus groups was analysed through a process of open coding based on conceptual labels (Strauss & Corbin, 1998). The data were analysed by the

lead author based on a process of generation and reduction of codes. The various answers given or ideas mentioned by students in response to a particular question or when discussing a specific topic were coded and counted. Recurring codes were counted and finally a subset of themes relevant to the research questions emerged (Creswell, 2003). The list of themes and codes are presented in Table 3.

**Table 3 Summary of Key Themes**

| **Theme** | **Codes (N)** | **Total** |
|---|---|---|
| Motivation | Learn by teaching (13), Have to plan/think (2), Both learn (2), Research (6), Pressure to know it first (14), Discover new ways to learn (1) | 38 |
| Relationship/Understanding | Concentrate more (6), Can relate better (18), Talk our own way (15), Same level (6), More respect (2), Know what is interesting (2) | 49 |
| Atmosphere | Less pressure (3), Comfortable (3), No judgement (2), Can make it fun (6) Relaxed atmosphere (2), Friendly teacher (8), Learning space (3), Class size (1). | 28 |
| How to teach | Thinking of a way to teach (25), Make it fun (4), Get them interested (6). | 35 |
| Planning/Decisions | Planning/Decision-making as a team (13), Work together (2). | 15 |
| Teach/Explain | Teach (6), Explain clearly (3), Public Speaking (2). | 11 |
| Learning/Research | Remember content (5), Understand without a teacher (1), Research (2). | 8 |
| Understanding/Respect | Easy to take in (8), Talk like friends (14), Relate better (7), Understanding (11), Respect (1), Same level (3), Variety of opinions (1) | 45 |
| Fun/Interesting | Make it interactive (4), more enjoyable (4), more fun (4), interesting (3) | 15 |
| Technology | Technology *(unspecified)* (6), Internet (2), Video (2), No more books (2). | 12 |
| Teamwork | Teamwork (8). | 8 |
| Active | Active (4), Interactive (1), Practical (3), Games (5), Song (5). | 18 |
| Project-based | Research (2), Discovery (2), Presentations (2), Continuous assessment (1). | 7 |
| | **Total Codes:** | 289 |

# Results

The participants created a variety of innovative learning experiences as described below, including Facebook pages for John F. Kennedy and Neil Armstrong as a way of describing the space race. The findings from the study are discussed below, firstly at a macro level, and then under the headings of the five research questions set out above.

## Overall Impact

In order to understand the overall student experience at a macro-level, the data from the pre and post implementation surveys were analysed, and Table 4 summarises the results showing average gains across all but one of the variables. For example, pre-implementation the mean response across items measuring the extent to which students found learning boring was 3.35 (Likert scale) post implementation, this had reduced to 1.76, a mean difference of 1.986 as indicated in the third column of the table. A paired t-test of this difference resulted in at t of 17.1 at a significance level of .001, suggesting that the difference is not likely to be an artefact of the sample and can be considered statistically significant. Expressing the mean difference as a standard deviation unit, the effect size of .89 was estimated. Within the framework suggested by L. Cohen, Manion, and Morrison (2011), this represents a substantial effect.

Significant differences were found for four other variables: independent learning, working by oneself, problem solving, and learning in groups. For example, data suggest that students who worked in groups in the workshop reported a much better experience as compared to their school experience; the mean response across this item post implementation was 1.84 as compared to 3.35 before the workshop began ( $t = -4.233$, $df = 74$, $p < .001$, $r = .44$). Similarly, students also reported the workshop experience more "interesting" compared to their school experience ($t = -10.338$, $df = 74$, $p < .001$). The effect size of .77 would be considered a substantial effect.

**Table 4 Pre-Post intervention differences and effect sizes**

| Focus Area | Mean Difference | SD | t-value | Effect Size (r) |
|---|---|---|---|---|
| Working by Oneself | 1.514 | 1.230 | 10.583* | 0.79 |
| Learning in Pairs | -.108 | 1.028 | -.905 | 0.11 |
| Learning in Groups (Peer) | -.6486 | 1.311 | -4.233* | 0.44 |
| Learning is Interesting | -1.405 | 1.169 | -10.338* | 0.77 |
| Boredom | 1.986 | 1.230 | 17.090* | 0.89 |
| Problem solve by myself | .7297 | 1.387 | 4.523* | 0.47 |

*P <.001

The students' feedback on their experience in the Learning Circles workshop was extremely positive. This is based on the post questionnaires, the focus groups, and the mentor interviews. They found this style of learning to be both enjoyable and effective. They described constructivist and constructionist styles of learning when asked to describe how they like to learn and attempted to implement these approaches in their teaching projects. They found it challenging to move beyond the traditional approaches to teaching and learning they usually experience in their own schools but, with some encouragement and support, most teams created innovative, active learning experiences for their peers.

## How Would Students Like to Learn

The first activity which each team carried out was to prepare a presentation on "how they like to learn". Analysis of the 17 presentations made by teams over the course of the 4 week study re-

vealed 18 separate codes, from which five main themes emerged. The students' ideas on this topic focused on technology, teamwork, a project-based approach to learning, being active and a positive atmosphere (see Table 3).

During their presentations many of the students said that they believed these ideas would make for enjoyable and effective learning scenarios. The ideas which were mentioned most often (teamwork, technology, active learning, research) are in keeping with constructivist and constructionist theories of education and were typical of many descriptions of 21C learning (Voogt & Pelgrum, 2005). They included teams of students, solving problems, learning through research and discovery, using modern technology, and presenting their work to their peers. A comfortable, modern learning space designed for team-based project work was mentioned by three teams, and a friendly and encouraging facilitator or mentors were proposed by eight teams. One notable feature of the analysis of how the students like to learn is that almost every theme that emerged was an element of the Bridge21 learning model.

Eight teams presented a negative view of schooling characterised by strict teachers and boring books in a "normal" classroom and then contrasted this with a more relaxed atmosphere in a modern, technology-rich learning space with a more informal facilitator leading the class. Teamwork, technology, and the atmosphere in the classroom were the most common issues mentioned, along with a desire for an active, project-based approach to learning. Learning through song and continuous assessment, as opposed to one final exam, were also specifically mentioned as ideas favoured by the students.

## How Did the Students Teach Each Other?

All of the teams engaged with the process and attempted to develop interesting learning experiences. During the first two workshops, eight teams out of nine used PowerPoint presentations as the main element of their learning experience.

In those two workshops, as it became obvious that most of the teams were relying heavily on PowerPoint, they were encouraged to include something more in keeping with their "How we like to learn" presentations to accompany the slides. When challenged, every team came up with at least one learning activity or experience to accompany their presentation and most came up with two or more. One team got their students to complete an online word-search, which, from a learning perspective, was little more than a time-filler, but most teams got their students engaged in some kind of productive work or at least a quiz-style activity to check for understanding/learning.

PowerPoint allowed the students to copy and paste material without really engaging with it and then deliver traditional presentations. As one student commented,

> "*PowerPoint is the easiest way for the teacher, not the best way* [for the students to learn]".

In the final two weeks, in order to avoid this over dependence on PowerPoint, teams were explicitly told they should not use it as the basis of the learning experience they created.

In those weeks, three teams still made slide presentations but they were a minor part of the learning experiences, three teams showed videos they had found on YouTube, four teams showed videos they had made themselves, two teams used online games, and one team used experiments to teach physics. One team wrote a short scene in Chinese to help their students learn some key phrases. As part of a history lesson, one team created Facebook pages for John F. Kennedy and Neil Armstrong and included key facts about the moon landings using status updates, see Figure 2. A team whose topic was Nazi propaganda got their learners to make a propaganda poster showing their team leader in a positive light, and another got their students to do the same about

Adolf Hitler. A lesson about Brazil included Samba lessons for all of the students and the facilitator!

A particularly innovative, and kinaesthetic, approach to learning was taken by one team teaching the digestive system. They asked their students to lie on the ground, one at a time, with each one performing the role of a different section of the digestive system. First, someone lay down straight, as the oesophagus. Next, someone curled in a ball at his feet, as the stomach, and so on. A "cheese-burger" made of Play-Doh was then passed through the system, from the oesophagus into the stomach etc. with the person at each stage explaining what their component of the system was doing, e.g., churn up the burger or extract the nutrients (green Play-Doh) from the burger – see Figure 3.


**Figure 2: Facebook page for Neil Armstrong**

**Figure 3: Modelling the digestive system**

## Limitations of students as teachers

There were a number of factors which reduced the effectiveness of some of the learning experiences created. In particular, a lack of presentation skills among some of the students was noted. A few students who had prepared slides turned their backs on their audience or just read aloud from their notes. The students, in general, had very little experience of public speaking and several were obviously nervous, even in speaking to a small audience of their peers. As students were, at times, at the limit of their knowledge of the subject they were teaching, there were a few factual errors in their work, e.g., one group had John F. Kennedy congratulating Neil Armstrong on reaching the moon. This was corrected by one of the "students" in the group. Two teaching teams made small errors: one in describing a slide on Probability, another discussing the physics of light. These were not picked up by the students. On a couple of occasions, the "teachers" attempted to bluff answers to their students' questions. In these situations, the facilitator encouraged them to admit that they didn't know, or to go and find out, rather than pretend otherwise. A few teams, who had excellent ideas for how their students could learn, did not clearly explain the context of a particular item or activity and, as a result, learners did not fully understand what was happening. For example, when a team teaching about Nazi propaganda wanted their students to create a piece of propaganda of their own they asked the learners to make a poster about anything they wanted without any direction about a subject for their poster or how the exercise was to help them understand the nature of propaganda.

Additional preparatory training for students on basic communication skills, along with judicious interventions by mentors, could help alleviate some of the difficulties just outlined. However, all the teams engaged with the process of attempting to create learning experiences that were inter-

esting and effective, in the opinion of their peers. To varying degrees, they achieved this goal - particularly when the option to use PowerPoint was taken away.

## *Support Required*

Over fifty-percent of the students stated that the biggest challenge teams faced was finding ways to make the material interesting or fun for their peers. Completing the task on time was mentioned by four students and general issues in relation to team work, such as working together and making decisions, were also mentioned. Remembering the material was mentioned by five students with just one student saying she struggled to understand the material without a teacher to explain it. In general, it seems that the students felt that learning the material without a teacher was quite achievable but having to teach it in a fun, interesting way was much harder.

The students' responses suggest that they enjoyed the workshops and found them both engaging and challenging. They were very positive about the idea of learning by teaching and positive, albeit less so, about the idea of learning from their peers.

The students were asked what the most challenging part of the whole process was and one overwhelming theme emerged. "Learning by doing" was highly rated in the "How we like to learn" presentations but implementing it, and the other innovative ideas that emerged, was a real challenge for the students. There was unanimous agreement that trying to think up interesting ways to teach the material or find ways to make the material interesting was much more difficult than they had envisaged and that they struggled with "finding a way to make it fun" and "coming up with different ideas to make it interesting". Two teams mentioned issues with managing the project within their own team as being a problem, and one team mentioned public speaking as being a challenge – although in practice a number of groups struggled with this aspect of the exercise. Interestingly, only one team mentioned learning the material for themselves as a problem.

### Mentors

The mentors stated that the students displayed "very high retention of [technical] skills" from previous participation in Bridge21 workshops and that "they were certainly able to learn it [the curriculum content] on their own". The biggest area where the students needed help was in planning how they would teach. The mentors said that finding "interesting ways to cover it" and "to do it beyond just presentation was the hard bit". They mentioned that in some cases they needed to pitch in an idea or two to get things moving but once they did that, most of the teams were able to come up with several options.

## *Student Motivation and Engagement*

The students found this style of learning to be interesting and enjoyable, and they were highly motivated throughout the workshops. On a five point scale with 1 representing "Excellent" and 5 representing "Poor", the 80 students who completed the questionnaire were very positive about the experience, giving an average rating of 1.25. When asked to give reasons for their choice they mentioned the fact that it was fun, that it was interesting, that they felt that they had learned something, that they met and got along with new people, and that they liked being part of a team among other things.

> *"It was incredibly fun ..... also very productive, I learned so many things ..... also improved my communications skills."*
>
> *"We got great work done as well as having fun."*

Five students reported that the experience was less fun than the first Bridge21 workshop in which they took part. The "overall experience" rating from these five students was 2.4, which is lower

than the mean of the whole group but still falls between "Average" and "Good" on the scale provided.

One lone student said he was *"used to school and didn't like the sudden learning change"*.

Most students said that the workshops were "Never" boring and "Always" interesting. This is in contrast with their opinions on their time in school, during which they are bored more often and describe it as "interesting" less often. The workshop experience was considerably more engaging than school.

The students were asked if they would like to take part in further workshops like this one and if they felt that learning a topic in preparation for teaching their peers created a higher level of motivation than learning it for an exam. In both cases, a 99% positive response represents an endorsement of the model of learning employed.

## *Student Learning*

The students were assigned a topic to learn, asked to teach their peers that topic, and asked to learn other topics from their peers, all without a domain expert teacher.

### Learning without a teacher

In general, the students were very positive about learning in this way. All of the teams said that "*it was easy enough to find info"* and a few said that while *"there were bits we didn't understand, most of it was okay"*. Two teams (both teaching physics) mentioned reaching a limit of what they could understand without any adult help. One team mentioned having to "*skim*" lots of websites to find the necessary information, some teams divided their topic into sections and each member took a section, while others discussed the topic amongst themselves and *"kind of explained it to each other as well, as we understood it."* The students' ability to filter through large amounts of online information is in keeping with Prensky's (2001) ideas about "Digital Natives".

When asked how did they learn the topic they were assigned to teach, 97% replied that they obtained the necessary material from the internet. They were not asked explicitly which websites they used but fourteen students mentioned YouTube or other online video sites and four mentioned playing online games related to their subject. Discussing the topic with their team-mates, attempting to "translate" ideas expressed in, what the students considered to be, "difficult" language into simpler terms, and creating and revising summary notes in preparation for their learning experiences were also mentioned. The mentors were rarely asked for help with this part of the project and there were only two teams who encountered topics that they could not understand.

It should be pointed out that the teams had some flexibility with which parts of their topic they wanted to cover and that some of the students had a level of prior knowledge of the topics they were assigned and may have tended to "play it safe" in terms of what they would teach. That said, based on facilitator and mentor observation, the teams were generally very engaged with this part of the project and almost every student said they had learned about the subject their team was teaching.

### Learning by teaching

The participants were very positive about the experience of learning for, and by, teaching, with over 92% stating that peer teaching is a good way to learn. They said that they had learned their topics very well by going through the process and they thought that what they had learned would stick with them.

The "digestive system" activity shown in Figure 3 lasted 5-6 minutes. In that time, the teaching team described the roles of the four types of teeth, saliva, the oesophagus, peristalsis, the liver, the stomach, bile, the small intestine, and the large intestine as they got their students to model the system themselves with the Play-Doh "food". Three members of the team took turns explaining the various elements and this was all done without reference to any slides or notes.

Another team, teaching about probability, introduced their students to terminology such as "chance","unlikely","probable" and "number of possible outcomes". They next described the probabilities involved in events such as a coin-flip, rolling a die, or choosing a specific colour of marble from a mixed bag. Finally, they explained the Fundamental Principle of Counting using various examples.

In running these activities, the students demonstrated a clear understanding of the material they had been asked to learn and teach. Their comments in the focus groups reinforce this finding.

> *"I could (now) write a page about the digestive system whereas before I could write a paragraph."*
>
> *"I didn't understand it before but I know all about it now"*
>
> *"I'll remember it, I really will."*

When asked why they had learned so well, they mentioned feeling under pressure to learn the material to teach it and that working through the process of creating and delivering a learning experience really forced them to engage with their topic. Many teams mentioned having to think about the material so they could simplify it and put it into their own words. The students reported that peer relationships and a shared level of language were advantageous in teaching each other. They also reported that the atmosphere created by peer teachers was comfortable, fun, and allowed them to ask questions, with less fear of judgement than in a normal classroom setting.

A small number of students disagreed, citing a lack of discipline without a teacher to maintain order as being a problem. One student pointed out that not all students are at the same level and that it is difficult for a "weaker" student to try and teach a "smarter" student. Overall though, most students felt that creating and delivering lessons for their peers was an effective way to learn.

## Learning from your peers

The students were positive about the experience of being taught by their peers, but not as strongly as with learning by teaching. 83% said that learning from their peers was a good way to learn.

When asked, in team interviews, if they had learned from their peers, two main ideas emerged. 50% of the teams said "Yes", while the other 50% gave more reserved, "Yeah, a bit", or a close variation of same. The teams who said "Yes" felt that they learned what the other team tried to teach them. The "partial learning" answers were from teams who felt they only understood some of what was presented to them.

Most students were very positive about peer learning in general, stating that "you understand more" and "you don't have to use 'big language'" but a few ($N < 10$) felt that they "didn't learn much" and that "there was a lot of information to take in." It was mentioned that the teaching students "need to prep well" and that they could explain well "if they know" the material. Other students mentioned "lack of experience" or discipline issues as potential problems.

It seems that there is some value in students learning from their peers but there are greater benefits for the "teaching" students in this setup.

# Discussion

This research study set out to explore peer teaching and learning without a subject expert teacher by examining an activity where teams of second level students are required to create a learning experience for their peers, who were students of a similar age and year group.

The following research questions were addressed.

- What did students say about how they would like to learn?
- How did students teach each other?
- What support did students require in learning and teaching without a domain expert teacher?
- Were the students creating, delivering and attending peer learning sessions engaged and motivated to learn?
- Did students learn without a domain expert teacher?

By exploring these questions, the authors sought to investigate the potential for this type of learning to be used in more formal educational settings.

The findings suggest that students would like to learn in a collaborative and constructivist manner. In describing how they learn in school, students reflected McGarr's (2009) claims about the limited impact that modern ICT has made in the classroom, and when given the chance to discuss how modern classrooms could be, they included many of the ideas frequently found in the literature as part of a 21C pedagogy, such as teamwork, technology, project work, and problem solving (Voogt & Pelgrum, 2005). A "how we like to learn" activity could be valuable with various student groups both in helping students and teachers understand one another and in encouraging students to think about their own learning.

The study suggests that, despite an initial tendency to "teach as they have been taught", students are capable, with some encouragement, of creating innovative 21C learning experiences for their peers. In the process, they created artefacts, both digital and physical, and developed new learning activities. Encouragement to go beyond the familiar ground of lecture-style presenting of information was vital in helping the teams to develop the varied learning experiences they created. The students needed help and support at various points in this project. The facilitator and mentors were on hand throughout to offer encouragement and to help the teams make decisions and stay focussed. This is typical of all Bridge21 student workshops.

There were two areas in which the students needed particular help during these workshops. The first was in coming up with interesting ways to cover the material. The teams said that this was the hardest part of the whole project. Whether trying to take a subject that they did not find interesting and make it so for their peers or just trying to avoid giving one long presentation, this was the area where the teams felt the most thought and effort was required. The mentors also commented that it was at this stage that they felt the teams required the most help, whether that involved encouragement or offering an idea or two to get the teams started. It was a challenge for the teams but it was one they engaged with and were, in most cases, able to overcome. The three sets of data supported each other in these findings and the triangulation allows some confidence in the conclusions drawn. As the students technical skills increase, there may be less help required with the "creating" portion of a project but in the "planning" phase (or phases) more help was needed. Once the students are comfortable with "How" to complete their project, or at least confident that they can work it out, the focus can shift to "What" and "Why" they want to say or create.

The second area where some of the teams struggled was in actually running their learning experiences. Some of the activities were not as well thought through or presented as they would be by a

trained teacher and as a result some of the learners were confused at times as to what they were supposed to do or why they were supposed to do it. This lack of experience as teachers and lack of confidence in making a presentation are common attributes in learners of this age group and are issues which are not usually addressed in the classroom. Further exposure to learning experiences as described here would, however, directly help to develop these skills.

This study took place in Bridge21. The facilities available and the style of learning employed were key factors in being able to run this activity. Physical resources, such as whiteboards, computers with internet access for research and creating digital artefacts, and the flexible design of the learning space that allowed for the teams to work as they saw fit, were all necessary elements of this workshop. The students had all previously experienced working in this environment and some referred to "*knowing how to work in a team*" as an important prerequisite to this activity. Students who were unable to make decisions together, take responsibility for their work, trust each other, and work to a deadline would struggle with this style of learning but, as with the communication skills mentioned previously, this style of learning would help develop those collaborative skills.

The students were, in general, highly motivated and engaged during this project. This was indicated by several complimentary data sources which suggests a good level of reliability. Student responses on the questionnaire and in the interviews show that they enjoyed the technology-mediated team-based project work they have done in Bridge21 in general, and the challenge of these workshop in particular. They rated the work they were doing as "Interesting" most of the time and very many students (N= 67) said they were never bored during the workshops. Overwhelmingly, they said they would like to take part in further workshops, like this one, if the opportunity arose and that knowing they would have to teach their peers was a big factor in motivating them to learn their topic for themselves.

The participants in this study believed they were able to learn without an expert teacher to teach them. They said they were able to find relevant information online and learn it whether working alone or with their teammates. Standardised tests may have provided a more quantifiable measure of the students' learning but were deemed beyond the scope of this study. Only one team said that understanding the content was a problem, and the mentors agreed that most teams were able to find and understand the relevant information without any help. The structured team-based approach used in Bridge21, in combination with learning for and by teaching, allows students to take ownership of their own learning and help develop the motivation required to learn. This is in keeping with the findings of Mitra and Dangwal (2010) about what motivated students can learn, even without a domain expert to teach them.

The findings support the idea that students can learn by teaching their peers. The students found that both the preparation and delivery of lessons was an effective way to learn both in terms of motivation and engagement with the material. This is in keeping with the work of Leung, Marsh, and Craven (2009), who claimed that peer teaching was an effective learning technique with benefits for both "teachers" and "students", and Benware and Deci (1984), who found that students were more motivated to learn for teaching than for an examination. This is not to suggest that collaborative self-teaching and peer teaching should replace domain expert teachers but that these teaching methods could form part of a varied teaching strategy.

The students said that learning from their peers was less effective than preparing learning experiences themselves. Over 80% said it was a good way to learn but when asked in interviews how well they had learned the topic only about 50% felt they learned what they were supposed to. This may be partly due to a lack of clarity about what they were expected to learn. They still spoke of the benefits of peer teaching and included many that were mentioned in the literature, such as a similar level of language, feeling comfortable asking questions or making mistakes, and the fact

that peers would have a good sense of what would be fun or interesting for each other. This is in keeping with the findings of Leung et al. (2009). When asked about the possibility of teaching their peers in school, four students mentioned that a teacher would still be needed to maintain order and one suggested that some students might struggle to teach a student they perceived as "smarter" than themselves.

It seems that learning for teaching and learning by teaching are very effective. Learning from peers was less successful in this study, but it is clear that it has an important role to play in this context, as it motivates the peer teachers to learn their subject and this learning is reinforced by preparing and delivering the learning experience.

The students found this workshop to be an effective and enjoyable way to learn. Their feedback was very positive in the interviews, questionnaires, and informal discussions with the mentors. They were highly motivated, felt they had learned well, and were keen to take part in further workshops if they could.

Finally, this study supports research which argues for the potential for learning without a teacher using peer teaching, technology, and teamwork. As the students said:

> *"....before you teach you have to double make sure you know what you're talking about...."*
>
> *"....when you're teaching someone something, you tend to learn yourself."*

# Conclusions

Globally, our education systems are at an inflection point; the rapidly changing economic and social environment in which we live and, more importantly, in which our children will live and work demands different skills and knowledge of productive citizens. Furthermore, a dominant feature of the emerging world our children will inhabit is the role and use of technology in the broadest sense of its meaning. Technology is, and will continue to be, omnipresent and ubiquitous. If the last five years is used as a benchmark we can only begin to imagine the extent that technology will impact on our lives over the next five years (Hallisey & Marshall, 2015). In this context, there is a need to equip students, teachers, and schools for a rapidly changing world driven by emerging technologies. Moreover, we need to challenge our assumption about the nature of knowledge. As Bransford noted, it is easy to fall into the trap of assuming that all schools should teach what we learned when we grew up (Bransford, Darling-Hammond, & LePage, 2000).

Furthermore, assessment of student learning remains one of the greatest challenges underlying the transformation of our education systems. If we are to explore new models of learning, then we must explore alternative models of assessment which in turn incorporate technology, teamwork, and peer learning (assessment). Only then will we build balanced learning environments that incorporate a wide range of learning experiences for students.

## *Limits of this Study and Further Work*

The study took place in an out-of-school context with students from several schools. This allowed the students to start with a "clean slate" in terms of their perceptions and expectations of their teammates and of their relationship with the facilitator and mentors at Bridge21. In a more formal environment, student attitudes may be affected by their relationships with teachers, the school environment in general, and their relationships with their classmates. These factors may affect the success of an exercise like this in such an environment.

The evidence of learning in this study was based on the students' perceptions of how well they had learned. Using standardised tests as a measure of student performance were deemed to be

outside the scope of this study. This was due to time constraints and the fact that, to make the tests meaningful, it would have been necessary to be very specific about the content the students should cover. Also, pre and post testing may have influenced how the students would try to teach each other. Instead, the students' opinions on the effectiveness of the learning experiences were the primary source of data used. Centra and Gaubatz (2005) state that "when a student rates overall instruction as effective, there is a correspondingly high perception of learning, as well as 'actual' learning as measured by course exams (Centra, 1977; P. A. Cohen, 1981; Feldman, 1989; Frey, 1978; Marsh, 1987)". The topics assigned to some of the teams in this case were quite broad. While this allowed students some freedom to choose which areas they would teach, it may have allowed them to avoid more difficult areas. A more detailed brief may have challenged the students to learn all aspects of the subject and allow for more meaningful measurement of their learning.

This study has focused on the overall cohort as a single case but there may be value in focusing on the experience of a single team or teams taking part in future workshops.

Finally it is worth noting that the exposure of participants to different models of learning was limited to their experience in school and partaking in Bridge21 workshops. All the schools attended by the students would be categorised as mainstream, focussing on traditional models of learning. The Bridge21 workshops, in contrast, take place in an out-of-school environment and are not leading to any formal examination or assessment. The participants were partly self-selecting for this workshop as they were voluntarily returning for a Bridge21 workshop and hence were favourably disposed to the model. From the cohort of over 200 that completed the original Bridge21 workshop, a small number of students were ruled out due to discipline or attendance problems in school. From this group, the 82 participants were randomly chosen, while maintaining an even gender balance and a fair distribution of places among the various participating schools. The students had the option not to attend but all available students that were offered a place chose to take it.

This research is part of a larger project which is investigating the use of the Bridge21 model in mainstream classrooms for teaching the standard curriculum. The findings from this study corroborate the view that team work (supported by technology) is an under-utilised approach in schools and, along with the pedagogy and process discussed in this paper, have much to offer.

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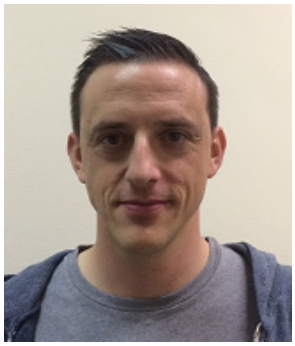
# Biographies



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