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i

The benefits of good teaching extend beyond course achievement

Chad N. Loes[1,2] and Ernest T. Pascarella[3]

Abstract: This paper synthesizes research from the Wabash National Study on Liberal Arts Education, the National Study on Student Learning, and the Research on Iowa Student Experiences study that estimates the influence of certain effective instructional practices on a range of student outcomes. Student perceptions of two specific teacher behaviors – instructor clarity and instructor organization – are associated with gains in a number of important student outcomes including critical thinking, propensity for lifelong learning, academic motivation, persistence to the second year of college, graduate degree plans, likelihood of obtaining a bachelor's degree, and student use of deep approaches to learning.

Keywords: Effective instruction, teaching, cognitive development, critical thinking, persistence.

Although there are hundreds of studies documenting the relationship between effective teacher behaviors and course-level student achievement, there is an emerging body of research suggesting that certain instructional approaches are also linked to a variety of other important outcomes. In this paper, we aim to synthesize what has been learned from three large studies by Pascarella and colleagues that estimate the overall effect of two particularly salient teacher behaviors on a wide-range of personal and cognitive student outcomes theoretically associated with a liberal arts education. We also endeavor to explore what these findings mean for colleges and universities, and explain how they can assist faculty in improving the delivery of instruction, thereby promoting growth in a number of important areas of student development.

There is a vast empirical literature on effective teaching in college. Literally, hundreds of correlational studies, and a limited number of experimental studies, linking student-perceived teaching practices with course-level knowledge acquisition and content mastery have been conducted (see Pascarella & Terenzini, 1991, 2005; and Perry & Smart, 2007 for a summary of the evidence). Two of these practices – instructor clarity and instructor organization – have received considerable empirical attention. It is important to note that the terms "instructional clarity" and "instructional organization" refer to student perceptions of these particular behaviors. Although student perceptions are not exact measures of teacher behaviors, they provide useful insight into whether instruction is actually effective. Ideally, the best indicator of good teaching is student learning. Perhaps unsurprisingly, evidence suggests that effective instruction is indeed associated with increased levels of student learning (Benton, Duchon, & Pallett, 2011). Further, after summarizing studies reviewed by Pascarella and Terenzini (2005), Pascarella, Salisbury, and Blaich (2011) note there are three major conclusions about student perceptions of teacher behaviors and instructional practices: "(a) these perceptions are multidimensional, (b) they are reasonably reliable and stable, and (c) they have moderate

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[1] Department of History, Politics, and Justice, Mount Mercy University, 1330 Elmhurst Drive NE, Cedar Rapids, Iowa 52402, cloes@mtmercy.edu
[2] Authorship is in alphabetical order
[3] Department of Educational Policy and Leadership Studies, The University of Iowa, N440 Lindquist Center
Iowa City, Iowa 52242, ernest-pascarella@uiowa.edu

positive correlations (e.g., .30 to .50) with various measures of course level learning such as course grade and course final examination" (Pascarella, et al., 2011, p. 5).

As suggested earlier, there is an impressive amount of literature documenting the positive relationship between specific instructional behaviors and course-related knowledge acquisition and student achievement. The literature on this subject is detailed in a number of meta-analyses and syntheses on good teaching (see for example, Abrami, d'Apollonia, & Rosenfield, 2007; Braskamp & Ory 1994; Cashin, 1999; Cashin, Downey, & Sixbury, 1994; d'Apollonia & Abrami, 1997; Feldman, 1996, 1997; Greenwald, 1997; Marsh, 1987; Marsh & Dunkin, 1997; Marsh & Roche, 1997; McKeachie, 1997; Wachtel, 1998). In his synthesis of effective teaching behaviors and student achievement, Feldman (1989) identified 31 specific teaching behaviors for inclusion in his analysis. Many of these instructional approaches (e.g., perceived outcome or impact of instruction, teacher's stimulation of interest in the course and its subject matter, teacher's availability and helpfulness) have relatively substantial, positive correlations with student achievement (.46, .38., and .36, respectively). Among the 31 teaching behaviors identified in the analysis, however, instructor organization and instructor clarity stand out as the strongest correlates of student achievement (r = .56 and .57, respectively).

Not surprisingly, the vast majority of this research is correlational. However, the predictive validity of student perceptions of teaching behaviors and instructional practices is not limited exclusively to correlational evidence. At least three of the dimensions of student perceptions of teaching having the strongest positive correlations with course achievement have been vetted with randomized experiments. These include: instructional clarity (clear explanations, effective use of examples), instructional organization (use of course objectives, effective use of class time), and teacher expressiveness (eye contact, speaking emphatically) (Hines, Cruickshank, & Kennedy, 1985; Schonwetter, Menec, & Perry, 1995; Wood & Murray, 1999).

Despite the large body of literature linking clear and organized instruction with student achievement, it was unclear whether these effective instructional practices influenced broader outcomes associated with college attendance. As such, nearly two decades ago, researchers affiliated with the 1992-95 federally-funded National Study of Student Learning (NSSL) hypothesized that, by improving content acquisition, overall exposure to instructional clarity and instructional organization/preparation during college might also enhance the development of more general cognitive skills that are tied less directly to specific course content (Pascarella, Edison, Nora, Hagedorn, & Braxton, 1996). They reasoned that, by facilitating the effective acquisition of factual knowledge, concepts, and important definitions, overall exposure to clear and organized instruction during college might permit greater emphasis on more general and higher-order cognitive processes and experiences (Feldman, 1994; Pascarella et al., 1996). They based their reasoning on Rabinowitz and Glaser's (1985) argument that sound content knowledge is a necessary foundation on which higher-order and more sophisticated intellectual development is built. Consequently, they developed two 5-item scales termed instructional clarity and instructional organization that appropriated specific items appearing in vetted research on these constructs. The constituent items and internal consistency reliabilities for both scales are shown in Table 1. Because the two scales are substantially correlated (teachers who are clear, tend also to be organized) some studies have also combined them into a single 10-item scale termed instructional clarity/organization.

Table 1

Constituent Items for the Instructional Clarity and Organization Scales [a,b]

Instructional Organization	A five-item scale (α = 0.87) that asks the respondents the following:

1. The presentation of the material is well-organized.
2. Teachers are well-prepared for class.
3. Class time is used effectively.
4. Course goals and requirements are clearly explained.
5. Teachers have good command of what they are teaching.

Instructional Clarity	A five-item scale (α = 0.86) that assesses the extent to which respondents have observed the following teaching behaviors:

1. Teachers give clear explanations.
2. Teachers make good use of examples and illustrations to explain difficult points.
3. Teachers effectively review and summarize the material.
4. Teachers interpret abstract ideas and theories clearly.
5. Teachers give assignments that help in learning the course material.

[a] Scale stem: "Below are statements about teacher skill/clarity as well as preparation and organization in teaching. For the most part, taking into consideration all of the teachers with whom you've interacted at [institution name], how often have you experienced each?" Response options: 5= "very often"; 4= "often"; 3= "sometimes"; 2= "rarely"; 1= "never." The scale was standardized across items for the entire sample.
[b] The alpha, internal consistency reliability of the combined "instructional clarity and organization scale" is .89.

A series of analyses of the 1992-95 (NSSL) longitudinal database that controlled for extensive confounding influences, including a pretest, found that the more students reported that the overall instruction they received in college was high on the instructional organization scale, the larger their gains on a standardized, objective measure of critical thinking (Edison, Doyle, & Pascarella, 1998; Pascarella et al., 1996). Similarly, a more recent analysis of the 1992-95 NSSL data combined the two 5-item scales into the 10-item composite instructional clarity/organization scale. Net of extensive confounding influences, the resultant composite scale had a significant, positive impact on gains in reading comprehension over three years of college (Bray, Pascarella, & Pierson, 2004). Though only an initial step, such early findings clearly suggested that overall

exposure to clear and organized instruction during college had positive implications for the development of general cognitive capabilities that were not tied to a specific course.

Building on the initial work of the National Study of Student Learning (NSSL), the Wabash National Study of Liberal Arts Education and Experiences (WNS) sought to further our understanding of how overall exposure to clear and organized instruction during college might facilitate student developmental gains in areas beyond individual course achievement. Funded by the Center of Inquiry in the Liberal Arts at Wabash College, the WNS is a large longitudinal multi-institution investigation of the impacts of liberal arts colleges and liberal arts experiences on the cognitive and personal outcomes typically associated with a liberal arts education. Over 40 institutions of all types have participated in the WNS since its inception. However, the findings we report in this article were based largely on the 2006-2010 cohort of 19 institutions (11 liberal arts colleges, 3 regional institutions, 3 major research universities, and 2 community colleges). The 19 institutions in the 2006-2010 cohort were located in 11 different states from 4 general regions of the United States: Northeast, Southeast, Midwest, and Pacific Coast. The participating institutions had a wide range of academic selectivity, from some of the most selective institutions in the country to some that we essentially open admissions. There was also substantial variability in undergraduate enrollment, from institutions with entering classes between 3,000 and 6,000, to institutions with entering classes between 250 and 500.

Random samples of incoming students were selected from each institution and were assessed at three different points in time: upon entrance to college in the fall of 2006, after the first year of college in the spring of 2007 and at the end of four years of college in spring 2010. At entrance to college in fall 2006 they completed a series of instruments that measured dimensions of cognitive and personal development, such as standardized measures of critical thinking, academic motivation, and the like, as well as providing extensive information on family background and high school experiences. At the end of the first year of college (spring 2007) they again completed the same standardized measures of cognitive and personal development and responded to a set questionnaire instruments that assessed their first year experience of postsecondary education. The questionnaire instruments included level of engagement, as measured by the National Survey of Student Engagement (NSSE), as well as perceptions of overall exposure to clear and organized instruction, as measured by instruments developed specifically for the WNS. At the end of the fourth year of postsecondary education (spring, 2010) the students in the 17 four-year colleges once again completed the standardized instruments measuring cognitive and personal development, as well as the same extensive series of questionnaire items measuring their college experience and overall perceptions of the instruction they received.

Responses to the instructional clarity and organization scale(s) in spring 2007 and spring 2010 presented students with the following stem: "Below are statements about teacher skill/clarity as well as preparation and organization in teaching. For the most part, taking into consideration all of the teachers with whom you've interacted with at [institution name], how often have you experienced each?" They were then presented with the 10 items shown above in Table 1, and four response options from "very often" to "never". All assessments at each institution were directed and administered by ACT located in Iowa City, IA. The results of the analyses we report are based on samples of approximately 3,100 students at all 19 institutions in spring of 2007, and approximately 2,200 students at the 17 four year colleges in the sample in the spring of 2010.

The longitudinal, pretest-posttest design of the WNS enabled us to estimate the effects of overall exposure to clear and organized instruction while controlling for an extensive battery of confounding influences. These typically included such influences as: a pretest measure of the outcome/dependent variable, ACT (or equivalent SAT/COMPASS) score provided by each institution, demographic and family background characteristics, high school experiences, educational aspirations, type of institution attended, work responsibilities during college, co-curricular involvement, type of coursework or academic major, and the like. In addition we typically used statistical procedures to adjust for the nested nature of our data (students at each institution tending to behave similarly), and weighted the samples to adjust for student response bias by race, sex, ACT score, and institution.

In an analysis of the data from the first follow-up (spring 2007) of the Wabash National Study, we attempted to test the robustness of an earlier finding from the 1992-95 National Study of Student learning (Pascarella et al., 1996) indicating that overall exposure to organized instruction during the first year of college facilitated first-year gains on a standardized measure of critical thinking skills. Using the same objective, standardized measure of critical thinking skills (The 32-item, multiple-choice Critical Thinking Test of the Collegiate Assessment of Academic Proficiency) as Pascarella et al. (1996), we introduced a battery of controls for such confounding influences as precollege level of critical thinking, ACT (or equivalent) score, precollege academic motivation, type of institution attended, and the liberal arts emphasis of first year coursework. With these controls in place, the instructional organization scale had a modest, but statistically significant positive link with first-year critical thinking gains for the entire sample (Loes, Salisbury, & Pascarella, 2014). This essentially replicated the same effect reported nearly 20 years ago by Pascarella et al. with the NSSL data.

Utilizing first-year data from the 2006, 2007, and 2008 cohorts of the WNS, Loes, Saichaie, Padgett, and Pascarella (2012) built upon previous work by Mayhew, Wolniak, and Pascarella (2008) that explored whether exposure to certain effective instructional practices were linked to specific cognitive student outcomes. While accounting for a wide-range of confounding variables, including precollege academic ability, race, sex, and pretest measures of the outcomes, they found that instructional clarity and organization were positively associated with gains in a measure of orientation toward complex cognitive activity termed "Need for Cognition," and a higher proclivity to engage in literary activities, termed "Positive Attitude Toward Literacy." These findings held true for all students in the sample, regardless of individual background characteristics.

The work we have reviewed heretofore focuses on the influence of effective instructional behaviors on a variety of student outcomes during only the first year of college. Less is known about the impact of these same teaching behaviors on outcomes over four years of college, however. Next, we synthesize some of the work from Pascarella and colleagues that explores four-year gains in cognitive development and cognitive orientation.

We conducted several studies to estimate the net impact of overall exposure to clear and organized instruction (the 10-item scale) on gains in critical thinking, orientation toward complex cognitive activity and academic motivation (Gillig, Roksa, & Pascarella, 2013; Pascarella, Wang, Trolian, & Blaich, 2013; Wang, Pascarella, Nelson Laird, & Ribera, in press). In these studies we also introduced statistical controls for a battery of confounding influences that included: a precollege measure of each outcome, ACT (or equivalent) score, high school experiences and family educational background, type of institution attended, major field of study, co-curricular involvement, and work responsibilities. Holding such influences constant,

we found that overall exposure to clear and organized instruction significantly enhanced four-year gains on a measure of standardized critical thinking skills (the CAAP Critical Thinking Test), NFC, and a measure of academic motivation.

There were also two other findings of potential significance, however. First, students attending liberal art colleges in the WNS sample tended to report significantly higher exposure to clear and organized instruction than did their counterparts attending regional institutions or national research universities – and this association persisted even when controlling for student precollege abilities and orientations. Indeed, most of the positive influence of liberal arts colleges on student cognitive growth was mediated through their (liberal arts college's) distinctive teaching environment. At the same time, it is important to point out that exposure to clear and organized instruction positively enhanced four-year gains in cognitive measures *irrespective* of the type of institution attended. Second, net of individual precollege abilities and orientations, students reporting greater overall exposure to clear and organized instruction also reported greater use of "deep approaches to learning," such as "integration," "reflection," and "higher-order learning," as measured by the National Survey of Student Engagement completed by WNS respondents during the spring 2010 assessment. This finding is consistent with theoretical expectations that, by facilitating efficient content knowledge, clear and organized instruction may permit a greater emphasis on higher order cognitive processes and experiences. In fact, student use of deep approaches to learning significantly mediated part, though not all, of the influence of overall exposure to clear and organized instruction on four-year gains in critical thinking skills and need for cognition.

In addition to gains in cognitive development and cognitive orientation, exposure to clear and organized instruction also appears to confer advantages to students in their likelihood of persisting to the second year of college, graduate degree plans, and bachelor's degree attainment. Several scholars have hypothesized that the nature and quality of classroom instruction may not only influence student learning, but could also exert a significant influence on persistence or departure from a particular postsecondary institution (Braxton, Hirschy, & McClendon, 2004; Tinto, 2006-2007). Some direct evidence for this is reported by Braxton, Bray, and Berger (2000). They reasoned that students who are frequently exposed to clear and organized classroom instruction might be more confident and relaxed about their academic achievement. Consequently, these students might perceive that they have more time "to invest the psychological energy necessary to establish membership in the social communities of their college or university" (Braxton et al., 2000, p. 216). In turn, increased social integration would enhance institutional commitment and intent to persist at the institution. Braxton, Bray, and Berger tested this hypothesis at a single institution using a measure of overall instructional clarity and organization essentially identical with Pascarella, et al. (1996). With important confounding influences statistically controlled, overall exposure to clear and organized instruction significantly enhanced both a measure of student social integration and intent to reenroll for the second year of college.

Of course one might argue that "intent" to re-enroll is not as important as the actual act of re-enrolling. Building on the work of Braxton et al. (2000), we therefore assessed the role played by overall exposure to clear and organized instruction during the first year of college on the actual re-enrollment of students for the second year of college at the same institution. Our assessment was based on two completely independent samples, but with nearly identical study designs. The first was a longitudinal study conducted by The University of Iowa's Center for Research on Undergraduate Education titled "Research on Iowa Student Experiences," which

assessed student experiences at The University of Iowa (Pascarella, Seifert, & Whitt, 2008), while the second analyzed data from the first year of the WNS (Pascarella et al., 2011). The findings of the two studies were remarkably consistent. With statistical controls in place for important confounding influences, such as ACT (or equivalent) score, educational aspirations, parental education, institutional type, and first-year co-curricular involvement and cumulative grades, the more students reported being exposed to clear and organized instruction during the first year of postsecondary education, the more likely they were to actually re-enroll at the same institution for the second year of college. Furthermore, in both studies the causal mechanism appeared to be a mediated effect through satisfaction with college. That is, overall exposure to clear and organized instruction significantly enhanced satisfaction with college, which, in turn, was a crucial determinant of re-enrollment for the second year of postsecondary education at the same institution.

We followed up our analysis of the influence of exposure to clear and organized instruction on first year persistence by extending the argument to the impact of clear and organized instruction on graduate degree aspirations. Hanson, Paulsen, and Pascarella (2014) analyzed the 2006-10 WNS data to estimate the net influence of overall exposure to clear and organized instruction on graduate/professional degree plans at the end of four years of college. With statistical controls in place for such confounding influences as precollege degree aspirations, ACT (or equivalent) score, precollege academic motivation and need for cognition, institutional type and selectivity, and academic major field of study, overall exposure to clear and organized instruction had a significant, positive link with fourth-year plans to obtain a graduate/ professional degree.

In our final investigation (Loes, An, & Pascarella, 2015), we built on the results of the Pascarella et al. (2008), and Pascarella et al. (2011) studies to determine if overall exposure to clear and organized instruction during college also contributes to completion of a bachelor's degree within four years. This is a consideration of some importance, as a recent synthesis by Toutkousian, Shafiq, and Trivette (2013) indicates that the greatest lifetime financial returns to individual investment in postsecondary education accrue to those who complete their bachelor's degree. Given the findings from prior research on the link between good teaching and persistence (Pascarella et al., 2008; Pascarella et al., 2011), we also reasoned that the influence of clear and organized instruction on graduating from college in four years would be mediated by one's satisfaction with college. Our analyses of the WNS 2006-10 data introduced statistical controls for such potential confounding influences as ACT (or equivalent) score, precollege degree aspirations and academic motivation, type of institution attended, major field of study, cumulative college grades, co-curricular involvement, and work responsibilities. With such controls in place, students reporting the highest levels of overall exposure to clear and organized instruction during college were significantly more likely than other students to actually complete their bachelor's degree in spring 2010. Further, similar to the Pascarella et al. (2008) and Pascarella et al. (2011) studies on effective instruction, the relationship between exposure to good teaching and graduation was mediated by satisfaction with college. This suggests that the influence of good teaching on bachelor's degree completion is mediated, or transmitted through, one's satisfaction with the college experience (Loes, An, & Pascarella, 2015).

We begin our discussion on the implications of clear and organized instruction with a note of caution. The body of evidence we have presented in this set of studies from the Wabash National Study is correlational rather than experimental. While the pretest-posttest, longitudinal design of the WNS is one of the most powerful available for estimating college impacts under

natural, rather than experimental, conditions (in which random assignment is possible), causal inference is, at best, tenuous. Our analytical approach throughout has been to posit a significant association between overall exposure to clear and organized instruction and a number of important cognitive and other outcomes that are not tied to specific course content. We then introduced as many important confounding influences as we could to the prediction model to try to reduce that association to zero. The fact that our posited association tends to persist when we take confounding influences into account is not the same as causality from randomized experiments. Rather, it simply means that, given what we have controlled for, we cannot dismiss the possibility of a causal relationship between overall exposure to clear and organized instruction and the various general cognitive and other outcomes we have considered.

That said, the evidence we uncovered has intriguing aspects. Effective teaching is at the core of the undergraduate experience in American postsecondary education. Clearly we should anticipate that it will enhance specific course learning. What is less apparent, and perhaps less expected, is that overall exposure to effective teaching may have positive consequences for cognitive and other outcomes that are not directly tied to specific coursework. Though they are tentative, we offer the following conclusions.

First, and consistent with theoretical expectations, it would appear that overall exposure to clear and organized instruction during college is significantly linked to student use of deep approaches to learning – such as higher-order learning, reflective learning, and integrative learning. Such deep approaches to learning mediate part, though not all, of the cognitive impact of exposure to clear and organized instruction. By facilitating the efficient acquisition of basic content knowledge, clear and organized instruction may permit students (and instructors) to focus on higher-order cognitive processes and experiences.

Second, we now have replicated evidence to suggest that overall exposure to organized instruction during the first year of postsecondary education may modestly, but significantly enhance first-year gains in critical thinking skills (as measured by a standardized instrument). Third, over four years of postsecondary education overall exposure to clear and organized instruction may significantly enhance four-year gains in critical thinking skills, Need for Cognition, and academic motivation. Interestingly, though perhaps not surprisingly, students attending liberal arts colleges reported significantly higher levels of overall exposure to clear and organized instruction than did their counterparts attending national research universities or regional institutions. Indeed, the unique influence exerted by liberal arts colleges on both four-year gains in critical thinking and orientation toward cognitive activity was substantially mediated through clear and organized instruction. However, this does not mean that clear and organized instruction only matters at liberal arts colleges. Rather, the unique effects of overall exposure to clear and organized instruction persisted irrespective of the type of institution one attended.

Fourth, the positive benefits of overall exposure to clear and organized instruction may not be limited exclusively to the cognitive outcomes of college. Replicated evidence suggests that overall exposure to clear and organized instruction during the first year of college may contribute to student persistence at a particular institution by enhancing students' satisfaction with the education being received. Similarly, overall exposure to clear and organized classroom instruction also appears to make a unique, positive contribution to fourth-year plans for a graduate or professional degree, and completion of one's bachelor's degree within a four-year period. In this sense, what happens in the classroom may contribute, not only to learning, but also to students' persistence and timely progress toward degree completion.

While it is understandable that faculty members may be most focused on how their instruction facilitates learning in specific courses, our evidence suggests that overall exposure during college to one important dimension of pedagogy, clear and organized classroom instruction, confers general cognitive and other benefits that transcend specific course achievement. Put another way, how well faculty teach in the classroom has potentially important implications that go beyond a specific course to influence students' general cognitive development, institutional persistence, and timely progress toward a bachelor's degree. It is likely that pedagogical competence is to some extent shaped by individual faculty capabilities and interests.

However, improving faculty members' skills in delivering clear and organized classroom instruction may not be totally circumscribed by innate pedagogical skills or professional propensities. As Weimer and Lenze (1997) have argued, faculty members can actually learn many of the constituent skills required to implement clear and organized classroom instruction. Institutional investment of resources in faculty development programs designed to enhance teaching or instructional effectiveness, as well as implementing instructional training as part of doctoral preparation programs, may not only improve course achievement, but also contribute to students' general cognitive growth and successful educational progress. Further, Loes and Salisbury (2013) point out that faculty can estimate the extent to which they are delivering clear and organized instruction by having students in their classes complete surveys that include the items from the instructional clarity and organization scales – that are the same as those used in this study (see Table 1). Doing this could enable faculty to not only determine their overall level of instructional clarity and organization, but it could also permit them to estimate whether there are any specific dimensions of their instructional clarity or organization that need improvement.

As noted earlier, there exists a vast body of literature documenting the positive relationship between effective instruction, generally, and student achievement. The literature we have synthesized here suggests the effect of two specific teaching behaviors (clarity and organization) extend to other important student outcomes theoretically associated with a liberal arts education, such as critical thinking, propensity for lifelong learning, and the like. We believe these findings can serve as a bridge for other teaching and learning research. Specifically, we believe there is much left to learn about the influence of other effective teacher behaviors (e.g., feedback, enthusiasm [Feldman, 1989]) on the outcomes reviewed here. Future research should not be limited to only the outcomes we have synthesized in this paper, however. Indeed, other researchers should test whether these and other teaching behaviors influence additional student outcomes that are championed by institutions throughout higher education. It seems the findings from those investigations could be tied directly back into classroom practices, thus enhancing the student growth that is desired by all institutions of higher education.

Acknowledgements

References

Abrami, P., d'Apollonia, S., & Rosenfield, S. (2007). The dimensionality of student ratings of instruction: What we know and what we do not. In R. Perry & J. Smart (Eds.), *Effective teaching in higher education: Research and practice* (pp. 385-456). The Netherlands: Springer.

Benton, S. L., Duchon, D., & Pallett, W. H., (2011). Validity of student self-reported ratings of instruction. *Assessment & Evaluation in Higher Education, 38*(4), 377-388. doi: 10.1080/02602938.2011.636799

Braxton, J. M., Bray, N. J., & Berger, J. B. (2000). Faculty teaching skills and their influences on the college student departure process. *Journal of College Student Development, 41*(2), 215-227.

Braxton, J. M., Hirschy, A. S., & McClendon, S. A. (2004). Understanding and reducing college student departure. *ASHE-ERIC Higher Education Report, 30*(3). San Francisco, CA: Jossey-Bass.

Bray, G. B., Pascarella, E.T., & Pierson, C.T. (2004). Postsecondary education and some dimensions of literacy development: An exploration of longitudinal evidence. *Reading Research Quarterly, 39*(3), 306-330. doi.org/10.1598/RRQ.39.3.3

Braskamp, L. A., & Ory, J. C. (1994). *Assessing faculty work*. San Francisco, CA: Jossey-Bass.

Cashin, W. E. (1999). *Student ratings of teaching: Uses and misuses*. Unpublished manuscript, Kansas State University, Manhattan.

Cashin, W. E., Downey, R. G., & Sixbury, G. R. (1994). Global and specific ratings of teaching effectiveness and their relation to course objectives: Reply to Marsh. *Journal of Educational Psychology, 86*(4), 649-657. doi: 10.1037/0022-0663.86.4.649.

d'Apollonia, S., & Abrami, P. C. (1997). Navigating student ratings of instruction. *American Psychologist, 52*(11), 1198-1208. doi: 10.1037/0003-066X.52.11.1198

Edison, M., Doyle, S., & Pascarella, E. (1998, November). *Dimensions of teaching effectiveness and their impact on student cognitive development*. Paper presented at the annual meeting of the Association for the Study of Higher Education, Miami, FL.

Feldman, K. (1994, January). *Identifying exemplary teaching: Evidence from course and teacher evaluations*. Paper commissioned by the National Center on Postsecondary Teaching, Learning, and Assessment. Stony Brook, NY: State University of New York at Stony Brook.

Feldman, K. A. (1996). *Reflections on the study of effective college teaching and student ratings: One continuing quest and two unresolved issues*. Unpublished manuscript, State University of New York, Stony Brook.

Feldman, K. A. (1997). Identifying exemplary teachers and teaching: Evidence from student ratings. In R. Perry & J. Smart (Eds.), *Effective teaching in higher education: Research and practice* (pp. 368-395). New York, NY: Agathon.

Feldman, K. A. (1989). The association between student ratings of specific instructional dimensions and student achievement: Refining and extending the synthesis of data from multisection validity studies. *Research in Higher Education,* 30(6), 583-645. doi*: 10.1007/BF00992392*

Gillig, B., Roksa, J., & Pascarella, E.T. (2013, November). *Predicting change in academic motivation: Academic and social factors.* Paper presented at the annual meeting of the Association for the Study of Higher Education, St. Louis, MO.

Greenwald, A. G. (1997). Validity concerns and usefulness of student ratings of instruction. *American Psychologist, 52*(11), 1182-1186. doi:10.1037/0003-066X.52.11.1182

Hanson, J., Paulsen, M., & Pascarella, E. (2013). *Understanding graduate school aspirations: The effects of good teaching practices* (Doctoral Dissertation, University of Iowa). Retrieved from http://ir.uiowa.edu/etd/2513/

Hines, C., Cruickshank, D., & Kennedy, J. (1985). Teacher clarity and its relationship to student achievement and satisfaction. *American Educational Research Journal, 22*(1), 87-99. doi: 10.3102/00028312022001087

Loes, C.N., An, B.P., & Pascarella, E.T. (2015). *Does effective classroom instruction enhance bachelor's degree completion? Some initial evidence*. Unpublished manuscript. The University of Iowa, Center for Research on Undergraduate Education.

Loes, C. N., Saichaie, K., Padgett, R. D., & Pascarella, E. T. (2012). The effects of teacher behaviors on students' inclination to inquire and lifelong learning. *International Journal for the Scholarship of Teaching & Learning, 6*(2), 1–20.

Loes, C.N., & Salisbury, M.H. (2013, November). *Does race moderate the cognitive impacts of good teaching?* Paper presented at the annual meeting of the Association for the Study of Higher Education, St. Louis, MO.

Loes, C.N., Salisbury, M.H., & Pascarella, E.T. (2014). Student perceptions of effective instruction and the development of critical thinking: A replication and extension. *Higher Education, September 2014.* doi: 10.1007/s10734-014-9807-0

Marsh, H. W. (1987). Students' evaluations of university teaching: Research findings, methodological issues, and directions for future research. *International Journal of Educational Research, 11*(3), 253-388. doi: 10.1016/0883-0355(87)90001-2

Marsh, H., & Dunkin, M. (1997). Students' evaluations of university teaching: A multi dimensional perspective. In R. Perry & J. Smart (Eds.), *Effective teaching in higher education:*

Research and practice (pp. 241-320). New York, NY: Agathon.

Marsh, H. W., & Roche, L. A. (1997). Making students' evaluations of teaching effectiveness effective: The critical issues of validity, bias, and utility. *American Psychologist, 52*(11). doi: 10.1037/0003-066X.52.11.1187

Mayhew, M. J., Wolniak, G. C., & Pascarella, E. T. (2008). How educational practices affect the development of life-long learning orientations in traditionally-aged undergraduate students. *Research in Higher Education, 49*(4), 337-356. doi: 10.1007/s11162-007-9081-4

McKeachie, W. J. (1997). Student ratings: The validity of use. *American Psychologist, 52*(11), 1218-1225. doi: 10.1037/0003-066X.52.11.1218

Pascarella, E. T., Salisbury, M. H., & Blaich, C. (2011). Exposure to effective instruction and college student persistence: A multi-institutional replication and extension. *Journal of College Student Development, 52*(1), 4-19. doi: 10.1353/csd.2011.0005

Pascarella, E. T., Seifert, T. A., & Whitt, E. J. (2008). Effective instruction and college student persistence: Some new evidence. *New Directions for Teaching and Learning, 2008*(115), 55-70. doi: 10.1002/tl.325

Pascarella, E. T., Wang, J. S., Trolian, T. L., & Blaich, C. (2013). How the instructional and learning environments of liberal arts colleges enhance cognitive development. *Higher Education*, *66*(5), 569-583. doi: 10.1007/s10734-013-9622-z

Pascarella, E., Edison, M., Nora, A., Hagedorn, L., & Braxton, J. (1996). Effects of teacher organization/preparation and teacher skill/clarity on general cognitive skills in college. *Journal of College Student Development, 37*(1), 7-19.

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students: Findings and insights from twenty years of research.* San Francisco, CA: Jossey-Bass.

Pascarella, E.T, & Terenzini, P.T. (2005). *How college affects students (Vol. 2): A third decade of research*. San Francisco, CA: Jossey-Bass.

Perry, R. P., & Smart, J. C. (2007). *The scholarship of teaching and learning in higher education: An evidence-based perspective*. The Netherlands: Springer.

Rabinowitz, M., & Glaser, R. (1985). Cognitive structure and process in highly competent performance. In F. Horowitz and M. O'Brien (Eds.), *The gifted and talented: Developmental perspectives*, (pp. 85-98). Washington, DC: American Psychological Association. doi: 10.1037/10054-003

Schonwetter, D., Menec, V., & Perry, R. (April, 1995). *An empirical comparison of two effective college teaching behaviors: Expressiveness and organization*. Paper presented at the annual meeting of the American Educational Research Association. San Francisco, CA.

Tinto, V. (2006-2007). Research and practice of student retention: What next? *Journal of College Student Retention, 8*(1), 1-19. doi: 10.2190/4YNU-4TMB-22DJ-AN4W

Toutkoushian, R., Shafiq, M.N., & Trivette, M. (2013). Accounting for risk of non-completion in private and social rates of return to higher education. *Journal of Education Finance, 39*(1), 73-95.

Wang, J., Pascarella, E.T., Nelson Laird, T.F., & Ribera, A.K. (in press). Impacts of clear and organized classroom instruction and deep approaches to learning on four-year growth in critical thinking skills and need for cognition. *Studies in Higher Education.*

Wachtel, H. K. (1998). Student evaluation of college teaching effectiveness: A brief review. *Assessment & Evaluation in Higher Education, 23*(2), 191-212. doi: 10.1080/0260293980230207

Weimer, M., & Lenze, L. (1997). Instructional interventions: Review of the literature on efforts to improve instruction. In R. Perry & J. Smart (Eds.), *Effective teaching in higher education: Research and practice* (pp. 154-168). New York: Agathon Press.

Wood, A., & Murray, H. (1999, April). *Effects of teacher enthusiasm on student attention, motivation, and memory encoding*. Paper presented at the annual meeting of the American Educational Research Association, Montreal, Canada.

Keeping it real: Exploring an interdisciplinary breaking bad news role-play as an integrative learning opportunity

Catherine Sweeney[1], Eleanor O'Sullivan[2], and Marian McCarthy[3]

Abstract: Palliative care is a complex area of healthcare best delivered by an interdisciplinary team approach. Breaking bad news is an inherent part of caring for people with life-limiting conditions. This study aims to explore an interdisciplinary breaking bad news role-play in a palliative care module. Participants were undergraduate medical and nursing students. Qualitative data from focus groups, student and facilitator feedback and a role-play recording were thematically analysed. The findings revealed that the role-play led to increased understanding of and changes in attitudes towards key palliative care principles, interdisciplinary teamwork, and communication of bad news. There was evidence of increased self-awareness. Findings suggest that the interdisciplinary breaking bad news role-play was a rich integrative learning experience valued by students.

Keywords: Interdisciplinary education, medical student, nursing student, breaking bad news, role-play, integrative learning

I. Introduction

Integrative learning is widely recognised as an essential component of modern third level education, (Higgs, Kilcommins & Ryan, 2010; Huber & Hutchings, 2004) providing students with concepts and frameworks that deepen their learning and assist in the development of key skills. Huber and Hutchings (2004) describe integrative learning as the making of connections between knowledge and skills from a variety of sources, the use of theory to inform practice, the ability to go beyond disciplinary boundaries in order to look at issues from a variety of perspectives and to look for solutions to real world problems. Interdisciplinary education is a commonly used means of providing integrative learning experiences (Carnegie Foundation, 2004).

The world of modern healthcare is constantly increasing in complexity as outlined by Plsek and Greenhalgh (2001). The Institute of Medicine (IOM, 2013) recommendations to address the issues of providing optimum healthcare at manageable cost include the need to develop systems that promote a culture of teamwork, communication and adaptability in the healthcare workforce, and to encourage patient and family engagement and empowerment. Hence the ability to think and work in an integrative manner is a vital aspect of modern healthcare.

Effective teamwork between disciplines is considered to be an essential component of modern high quality healthcare (Berwick, 2002; Legatt, 2007). Key organisations including the IOM, (2001), General Medical Council, (GMC, 2009) and the World Health Organisation (WHO, 2010) have highlighted the role of interdisciplinary education in preparing future

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[1] Medical Education Unit, University College Cork, c.sweeney@uss.ie
[2] Cork University Dental School & Ionad Barra, University College Cork, eleanor.osullivan@ucc.ie
[3] Ionad Barra, The Teaching and Learning Centre, University College Cork, mmccarthy@ucc.ie

healthcare professionals for interdisciplinary teamwork. While many modern undergraduate healthcare courses offer integrated curricula, the focus is usually on integrating the sciences (basic, behavioural and social), ethics and clinical practice. Interdisciplinary initiatives in undergraduate healthcare education remain the exception rather than the rule (Leggat, 2007).

In the contexts of education and clinical practice, the terms 'interdisciplinary' and 'interprofessional' are often used interchangeably. For the purpose of this article, the term interdisciplinary will usually be used in both contexts, while the original term used will be referred to in cited work. Interprofessional education has been defined as occurring "…when two or more professions learn with, from and about each other to improve collaboration and the quality of care" (Centre for the Advancement of Interprofessional Education, 2002). Jessup (2007) outlines the variety of terms used to describe healthcare practice where more than one discipline works in a team. Multidisciplinary teamwork is often used to describe healthcare practice where a number of disciplines work independently to care for a patient but interact formally to ensure that a range of care needs is covered. Practice involving a more integrated approach to care, demonstrated by a greater degree of interdependency between disciplines and individuals, with collaboration and sharing of expertise to achieve a common goal is increasingly referred to as interdisciplinary or interprofessional teamwork as outlined by Speck (2006).

A. Palliative Care Education

The WHO defines palliative care as "an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual". The impact of a life-threatening illness on an individual and their family is multidimensional and hence palliative care provision is complex. Delivery of good quality palliative care requires clinicians who work collaboratively in interdisciplinary teams in an integrated manner. In addition, all healthcare professionals are highly likely to encounter individuals and families with palliative care needs and hence basic palliative care competencies are important for all at the point of qualification (GMC, 2009; Parry 2011; WHO, 1996). The European Association of Palliative Care (EAPC) recommendations on undergraduate medical curricula in palliative care (2013) and palliative nurse education (2004) identify key domains that need to be addressed to achieve these basic competencies. These include the principles of palliative care, symptom management, ethical and legal frameworks, patient and family perspectives, communication skills, self-awareness and teamwork. Hence palliative care education has the potential to provide a rich integrative teaching and learning experience. In particular, palliative care has been identified as a good setting for interprofessional undergraduate education by Wee et al., (2001), while Dando, d'Avray, Colman, Hoy, and Todd (2012) found that an interprofessional clinical placement in a hospice increased student awareness of professional roles.

Despite its apparent suitability, palliative care undergraduate education has not been well studied in the context of integrative learning or interdisciplinary education (Head et al., 2014). A recent mixed-methods study of palliative care education co-ordinators conducted in UK medical schools found that the main focus of most palliative care education programmes at undergraduate levels was assessment and management of common symptoms, while only 35% of programmes provided specific education on multidisciplinary teamwork (Gibbins, McCoubrie, Maher, Wee, & Forbes, 2010). Dickinson (2006) reviewed teaching of end-of-life issues in US medical

schools and found that multidisciplinary teaching had increased from 59% in 1975 to 82% in 2005. Interestingly, neither of these national studies gathered data on interdisciplinary education.

B. Breaking Bad News

Buckman, (1984) defined breaking bad news (BBN), as delivering "any news that drastically and negatively alters the patient's view of her or his future"(p. 1597). The manner in which bad news is broken is significant for the individual receiving it and hence BBN training is widely considered to be an important facet of preparing undergraduates for clinical practice (GMC, 2009).

Usually BBN is taught by providing a theoretical framework such as the SPIKES model (Baile et al., 2000) and providing an opportunity for practice through role-play. Table 1 briefly outlines the SPIKES model.

Table 1

Summary of SPIKES model for BBN

	Activity
S	**S**etting up the consultation
P	**P**erception – assessing the patient's perception of their situation
I	**I**nvitation – obtaining the patient's invitation/permission
K	**K**nowledge – giving the patient the knowledge/information
E	**E**motion – acknowledging the patient's emotional response **E**mpathy – supporting the patient with empathy
S	**S**trategy for future care/management **S**ummarising the consultation

Role-play can be a powerful educational tool and is well suited to teaching and learning complex communication skills such as BBN. O'Sullivan (2011) stated, "the educational use of role-play has the potential to connect with people resulting in what we might call a felt understanding" (p. 536). Furthermore Sellers (2002) has asserted that role-play, "is capable of influencing participants' attitudes and emotions, whilst simultaneously promoting higher order cognitive skills" (p. 498). The action of role-play allows students to develop know-how and understanding. Hence amongst other things, role-play fosters changes in attitudes and perceptions and can facilitate modification of behavior (Bolton & Heathcote, 1999). A well-constructed palliative care BBN role-play requires participants to bring together knowledge of palliative care principles, understanding of patient perspectives, communication skills and teamwork. It therefore offers an ideal opportunity to assess integrative learning. BBN role-play can provide a practical opportunity for interdisciplinary education. However, little research has been undertaken in this area at undergraduate level. Wakefield, Cocksedge and Boggis (2006) qualitatively assessed an optional non-palliative care BBN course for medical and nursing students involving a BBN role-play scenario. Focus group interviews were used for post course evaluation. Themes emerging included the benefits of observing how other professions viewed problems, valuing other team members, and seeing other ways to do things. Our literature review did not find any studies of BBN teaching in an undergraduate interdisciplinary palliative care education context.

C. Module Context and Teaching Methods

Palliative Care: An Interdisciplinary Approach (IP3008) is a 5-credit optional module offered to medical and nursing students in University College Cork (UCC). UCC runs two undergraduate medical programmes: a 5-year Direct Entry Medicine (DEM) course for secondary school leavers and a 4-year course Graduate Entry Medicine (GEM) course for students with a primary degree. Third year DEM, second year GEM students and final (fourth) year nursing students are offered enrolment on this module. Learning outcomes for IP3008 are outlined in Appendix A and module structure is summarised in Appendix B. Teaching consists of twenty hours of face-to-face teaching (10 x 2 hour sessions on consecutive weeks) and a 6-hour online learning component on symptom assessment and management that complements three small group case-based learning sessions. Teachers come from a variety of disciplines and both clinical and academic backgrounds, including medicine, nursing, social work, physiotherapy and chaplaincy. Teaching is delivered in the education department of Marymount University Hospital and Hospice. In 2013/14 thirty-one students took the module (11 nursing, 10 DEM and 10 GEM students).

There were three student role-plays in the module, namely: (i) An initial non-clinical fun role-play, where students in groups were given a bag of props and asked to act out a scene from the owner's life. (ii) A relatively low stakes role-play of an interdisciplinary team meeting to organise a patient discharge. This was preceded by a fish-bowl role-play where students observed the enactment of an interdisciplinary palliative care team meeting by healthcare professionals. (iii) The BBN role-play, which acted as a culminating performance.

The BBN session started with an introductory 30-minute overview lecture introducing the SPIKES model of BBN. Students were then divided into three groups with a mix of medical and nursing students in each group. Each group was assigned a facilitator and an experienced patient role-player. The three facilitators were healthcare professionals with prior training in communication skills and experience of teaching BBN. Learning outcomes for the BBN session are outlined in Table 2.

Table 2

Learning Outcomes for Breaking Bad News Session
Following this session students should be able to:
Identify the key components of BBN and apply these to a BBN role-play
Explain why BBN should be viewed as a process rather than an event
Explain why active listening is important in BBN
Argue the case for an interdisciplinary approach to BBN in a palliative care setting
Discuss the need to tailor BBN to the individual and their own unique circumstances

Students were asked to volunteer to take part in the role-play scenes; nursing students to play nursing roles and medical students to play medical roles. Table 3 outlines the structure used in the role-play.

The role-play was divided into 4 scenes reflecting real world stages in BBN. To maximise the number of students involved in the role-play, different students from the group took part in each scene, except for the final scene where the 3 nursing students from the previous scenes came together. In all scenes, at least 2 students were involved in the role-play. The

remaining students acted as observers. A practising palliative care physician wrote the two-part scenario used for the role-play (Appendix C). All participants received part 1; part 2 was only given to the patient role-player, the facilitator and nursing students who volunteered to role-play (this second part contained 2 pieces of sensitive information that the patient had divulged to the nurse on a previous occasion). Observers were not given the scenario. The enactment of the role-play required participants to integrate knowledge of palliative care principles, understanding of patient perspectives, communication skills and teamwork.

Table 3

Role-play Scenes

Scene	Title	Description	Participants
1	Pre-planning meeting	Nurse and doctor meet to review the case and plan BBN meeting with the patient	Nursing student 1 Medical student 1
2	Meeting to BBN	Nurse and doctor meet the patient to BBN	Nursing student 2 Medical student 2 Patient role-player
3	De-briefing meeting	Nurse and doctor meet to debrief on the BBN meeting	Nursing student 3 Medical student 3
4	Post BBN support meeting	Nurse meets patient after BBN to support the patient and address patient concerns	Nursing students 1,2 and 3 Patient role-player

II. Study Aims

Our study aims were twofold:
1. To explore how an interprofessional BBN role-play can support integrative learning in a palliative care context.
2. To gain insights into students' learning and their experience of the role-play which would inform future teaching.

III. Methods

Ethical approval for this research project was obtained from Cork Research Ethics Committee of the Cork Teaching Hospitals and UCC School of Medicine Research Committee Ref ECM3(xx) 01/10/13.

Qualitative methods were considered most appropriate to explore the complexity of student learning in this area (Norton, 2009). An action research approach was taken as described by Metettal (2001) and outlined in Table 4. Schön (1995) has endorsed the use of action research to use practice to generate knowledge. Methods used for this investigation reflected on practice to uncover the evidence and development of student learning.

Qualitative data were obtained from the following sources:
a) Pre-module focus group student interviews to ascertain students' reasons for choosing the module and attitudes towards the interdisciplinary nature of the module (audio recordings and observer notes).

b) Audio recording of one of the BBN role-play sessions and review of observer notes
c) Facilitator BBN feedback questionnaire (Appendix D)
d) Anonymous student BBN feedback questionnaire (Appendix E)

Table 4

Seven Steps of Classroom Action Research (Metettal, 2001)

Step	Action
1	Identification of research question or problem
2	Literature review
3	Planning of research strategy
4	Data gathering
5	Data interpretation
6	Take action based on findings
7	Dissemination of findings

Two focus group interviews (one for medical students and one for nursing students) took place the week before the module started; each lasted approximately 45 minutes. Students attending these interviews provided written consent. Interviews were conducted by the first author and observed by a lecturer who teaches on the module. Interviews were tape-recorded and the observer made written notes. Initial focus group recordings were listened to, re-listened to and observer notes studied.

The first author observed one of the BBN sessions and took notes. The session was also tape-recorded. The recording was transcribed and studied along with the notes taken during the session.

The student BBN feedback questionnaire was distributed and collected at the final session of the module (1 week after the BBN session). Facilitator questionnaires were distributed 10 days after the BBN role-play session and returned shortly thereafter. Data were collated from the facilitator questionnaires. Thematic analysis of these data was undertaken manually by the first author using the method outlined by Norton (2009): data immersion, generation of categories, deletion of categories, merging of categories, checking of themes and linking of themes. Categories were reviewed and refined following discussion with co-investigators. The same method was used for analysis of the student questionnaires.

Early preliminary analysis of all data was undertaken and this informed further data collection e.g. student questionnaire feedback on the BBN session influenced the design of the facilitator questionnaire.

IV. Results

A. Pre-module focus group interviews

Ten students attended each of the 2 focus group interviews. Analysis of Focus Group interviews (recordings and observer notes) revealed that none of the students had chosen the module for its interdisciplinary nature; in fact, many were surprised that it was interdisciplinary (despite the fact that this was stated in the title and detail of the module descriptor). Notwithstanding this, students seemed to view the opportunity to learn with students from another discipline positively.

Both groups of students reported that they chose the module because of perceived educational needs and for some an interest in pursuing a career in a related specialty. Nursing students perceived this to be a rewarding area of work. Some medical students reported an interest based on prior personal or professional experience with palliative care.

Table 5

Summarises demographics of students enrolled on the module

	Nursing Students	Medical Students
Number	11	20
Sex Female	10	11
Male	1	9
Median Age (years)	22.5	24
Age Range	20 – 50	20 - 37

B. Audio recording of a BBN role-play session and observer notes

The role-play session commenced with the purpose (to give students a chance to practice in a supportive environment) and structure of the session being explained to the group. Students were asked to volunteer for role-play (3 nursing and 3 medical students). The ground rules and scene were set. Students were advised they could halt the role-play at any time if they felt they were in difficulty and that the facilitator would pause and rewind the role-play at times.

The session continued with the first scene. The two students discussed the case but required guidance to focus on what information they would be divulging and to get to the point where they felt would be able to act as a team. Some of the sensitive information that only the nurse knew was divulged to the doctor, but not all. In the second scene students followed the SPIKES model to break the bad news but struggled at times with coordinating their efforts as a team. The facilitator provided guidance at these points on how to work as a team, recognize the limits of one's role and defer to a colleague.

The group explored the challenges of dealing with the patient's emotions and their own reaction to these. Throughout the role-play Student efforts were affirmed and parts of scenes were rewound and replayed to allow students to experience the effects of different actions. The later scenes were played with students demonstrating increased understanding of teamwork as they progressed by demonstrating knowledge of the limits of their role, handing over to their colleague when appropriate and making sure important aspects such as support for the patient's

family were covered. The ethical issues around disclosure of sensitive information were also teased out.

The students who were observing were engaged and provided insightful feedback throughout the session. Finally the facilitator led a debriefing of the entire session involving all participants and observers in which the emotional impact of the session and the importance of self-care were discussed.

C. Facilitator feedback on BBN Role-play

Feedback was obtained from the 3 facilitators of the role-play groups. Facilitator feedback identified three main themes, namely: role-play as a teaching method, student performance in areas such as palliative care knowledge, teamwork and communication, and implications for future teaching.

Role-Play as a Teaching Method. Role-play was considered to be the best way to teach students the skills needed to break bad news. One facilitator stated, "There is no better way than to sit in the hot seat and really experience what it could be like in the real world … Very good for developing problem-solving skills as well as critical thinking skills …" (Facilitator 1). Another added, "Properly conducted and managed experiential learning in the style modelled here is not just a good way to teach breaking bad news, it is the only way." (Facilitator 3).

Students gained practical experience of dealing with a realistic complex communication challenge in an interdisciplinary context. The role-play was described as "disarmingly realistic … excellent experiential tool" (Facilitator 3).

A high level of student engagement with the role-play scenarios was apparent from all facilitators' feedback. Students engaged with both the role-play process and with the case as evidenced by appropriate verbal and non-verbal responses to the patient and her predicament: "It engaged all students and incorporated both the medical and nursing role" (Facilitator 2). Facilitator 3 was reportedly surprised by "The honesty of the students and their willingness to trust the facilitator and the process. I suspect that this was facilitated by the relationships and trust that were established in the earlier sessions.".

Student Performance. Through their performances, students demonstrated an awareness of palliative care principles and ethical issues taught earlier in the module and elsewhere in their undergraduate courses. These included holistic patient care, the concept of total pain, the focus on quality of life and the family unit.

The complexity of balancing confidentiality versus divulging information that was important for the team was handled well by some nursing students. "They were sensitive to divulging this information and only did so if they felt it impacted on the decisions being made on the patient." (Facilitator 1). However, this was not the case for all students as one facilitator commented, "In our group the nurse divulged none of this sensitive information at the planning meeting. I think that it really only emerged with some prompting toward the very end of the exercise." (Facilitator 3). In this group this presented a teaching and learning opportunity and a discussion was facilitated around the needs of team members for information and how to seek permission from a patient to disclose sensitive material.

Students initially struggled with the interdisciplinary team aspects of the role-play, for example they didn't refer to their colleague for aspects where they had more expertise. This was attributed to lack of experience of working in an interdisciplinary team. As the session progressed, students appeared to develop a better understanding of how to work in a team and

the advantages and challenges of having the two disciplines involved and working together. One facilitator commented, "Understandably, when one considers the lack of experience amongst the group, the meeting was largely focused on the mechanics of telling the patient the news. In later scenarios, there was a greater sense of working together but given the relative inexperience of the group, I would not have expected any other outcome." (Facilitator 3). Another added that, "Students eventually realized that the different disciplines cannot work in isolation from each other – it has to be a team approach with the patient and their family" (Facilitator 1).

Giving difficult facts to the patient while maintaining hope and responding to the patient's emotions were major challenges for the students. One facilitator reported, "They were very uncomfortable with the notion of upsetting or distressing the patient..." (Facilitator 3). Despite these challenges students appeared to appreciate the opportunity to practice BBN, "There seemed to be relief on students' faces, as if that was their first one done!" (Facilitator 2), "…. and as difficult as it was, appeared to appreciate the experience." (Facilitator 1).

Implications and Recommendations for Future Teaching and Learning. There were two main recommendations:

- All facilitators agreed that more practice of role-play to develop skills and improve performance was very important.
- Students need to see performances of good communication in BBN either by being present to see it first hand, "appropriate 'modelling' in the clinical environment as students or young post-graduates" (Facilitator 3) or by watching recordings of experts.

D. Student Feedback on BBN Role-play

Twenty-four students completed the anonymous written feedback questionnaire on the BBN session. Analysis revealed three main themes: changes in knowledge, skills and attitudes, the experience and emotional impact of the BBN session, and BBN role-play as an educational method.

Changes in knowledge, skills and attitudes. Student responses provide evidence that the BBN role-play brought together and reinforced prior learning. One student commented, "It brought every part of the module together. It's as if every week built up to it" (Student 15).

A number of subthemes were identified relating to the impact of the session on the students' knowledge, skills and attitudes relating to their future roles as healthcare professionals. Evidence emerging from the analysis included understanding in the areas of palliative care, communication skills and teamwork.

Understanding of Palliative Care. Students gained an appreciation of the importance of holistic patient and family care and of seeing things from the patient's perspective, understanding non-physical dimensions of serious illness and offering appropriate ongoing support of these dimensions in an integrated manner. Many commented on how the role-play had helped them to see the impact of BBN on those receiving it. Students frequently indicated increased understanding of 'Total Pain', which relates suffering in a broad sense. One student stated, "The topic of 'Total Pain' really came into action in the role-play. I realized there's so much more than just the physical aspects of cancer. It's important to be aware of the emotional, spiritual and social aspects of pain" (Student 13). There was evidence that students appreciated that palliative care addresses all these dimensions and focuses on maximizing quality of life, and that it is not just about care in the final days of life.

Communication. Analysis revealed that students gained greater understanding of the need for good communication and how to do it. One student reported that he now understood "how 'emotions' of patient and Dr may be handled…. How to inform the patient of bad news and not overload them, rather, give them time to digest the information" (Student 18). Many commented that they had gained knowledge and learned practical skills that would help them in their future careers as healthcare professionals. The structured approach using the SPIKES model received positive feedback. One student stated, "It emphasised the need to have a structured approach not just launching into a conversation, a great deal of planning is necessary…." (Student 18). Again there was evidence of attitudinal change; one student commented that the role-play had, "Taught me active listening and how you can be there for someone without saying anything at all" (Student 14). There was an acknowledgement that BBN is a process rather than a single event.

Interdisciplinary Teamwork. Areas of interdisciplinary teamwork where students had gained increased understanding included, the need for and benefits of teamwork, roles within the team, and practical issues in team working.

The broader perspective provided by a team approach and the benefits of this to the patient and the family were highlighted. A student reported that the role-play had helped her "… to realise how valuable the team members are and that each member comes with a slightly different view of the patient because of the different interacting roles and all these view points are important in helping the patient" (Student 4).

In addition to the advantages of an interdisciplinary team approach for the patient and their family, there was evidence that students' perceived benefits for the healthcare professionals involved in terms of the support team members can give to each other and learning from other disciplines.

The experience and emotional impact of BBN on the students. Many students indicated that they found BBN difficult. Some mentioned the challenges in maintaining hope for patients and families. Other students mentioned the emotional impact of BBN, "How emotionally involved everyone was, even those just watching. Hours later we were still affected by it" (Student 19). Students appeared to have become more aware of the range of skills required of healthcare professionals. One student stated, "I realise…the broad range of skills needed to be a successful healthcare professional in the area" (Student 11).

The feedback indicated that students had been surprised at how difficult it was to BBN. The experience had prompted self-reflection and for some awareness of their learning needs. One student commented that he was surprised by "how drained and inadequate I felt when delivering the bad news" (Student 5), while another stated, "I know my shortfalls now after doing it and can go on and try to improve on these. I gained confidence with what I am good at with respect to BBN" (Student 11).

However despite the difficulties involved, many commented on positive aspects of the experience. Students appeared to have valued the opportunity to practice in a controlled environment as preparation for the day when they would be doing this in the real world. A sense of accomplishment and relief was expressed by a number of students with one stating "I thought it would be very sad + upsetting. I found it tough but enjoyable and therapeutic" (Student 14).

BBN role-play as an educational tool. Many students referred to the role-play in terms of how real they found it and how it engaged them. The sense of reality brought by role-playing appears to have made a deep emotional impact. This often surprised students. One student stated, "How I imagined this case so strongly that it seemed real & made me feel a range of emotions throughout…" (Student 18). Students appreciated role-play as a teaching method, "I think the

role-play was an excellent method of teaching" (Student 14). The provision of theory and practice on the same day appears to have been well received.

V. Discussion

This study provides evidence that a palliative care BBN role-play can offer a rich integrative learning experience that is highly valued by students. Evidence from the role-play recording, facilitator and student feedback supports the assertion that integrative learning occurred. Students' feedback indicates increased understanding in key areas of relevance to palliative care, including the need for holistic care of patients and families, interdisciplinary teamwork, how to communicate difficult information and professional responsibilities. Evidence from facilitator feedback and the audio recording of the BBN session also support this. The finding that the session prompted student self-reflection and self-awareness is further evidence of integrative learning.

According to the Association of American Colleges and Universities and the Carnegie Foundation (2004), in order to provide integrative learning students must be supported to "put the pieces together and develop habits of the mind that help them to make informed judgments". Huber and Hutchings, (2004) have asserted that working on real-world problems that highlight the need to consider different perspectives and challenge students to make connections from disparate areas facilitates integrative learning. A number of factors contributed to the integrative learning potential of the BBN session. Firstly palliative care is a complex field where an integrated approach is needed. Hence the context of the BBN session was an important factor. In addition, BBN in itself is a complex communication challenge and using role-play as a teaching method highlights to students the difficulties encountered in its performance. The interdisciplinary nature of the student group also provided a very significant integrative learning opportunity. The carefully constructed scenario which was designed to bring out disciplinary perspectives, ethical aspects and the multidimensional nature of issues faced by palliative care patients provided a vital scaffold for the teaching and learning in the session. In addition, the real-life authenticity of the process of BBN (planning, delivering, supporting and debriefing) added a further important dimension. Both students and facilitators commented on how real the role-play seemed. Analysis of data from facilitator and student feedback and the audio recording of the role-play indicate that there was a high level of emotional engagement with the session, which in itself can make for a potent integrative learning experience according to Huber & Hutchings (2004).

This research has a number of limitations. Firstly, the qualitative approach taken has implications in terms of generalizability. Secondly only two disciplines were involved. It would be valuable to involve students from other key disciplines such as social work to broaden the interdisciplinary aspect. Unfortunately due to timetabling issues we are not currently in a position to offer the module to students from other disciplines. Another limitation is the elective nature of the module; as the students self-select there is a possibility that those who participated in this study are more integrative learners than their peers. However, as none of those interviewed chose it because of its interdisciplinary nature it appears this was not a motivating factor for students' choice. This research was conducted during and in the immediate aftermath of the BBN session. It is not possible to predict what the long-term impact will be on students and this is an important area for further study. In order to develop as integrative thinkers, students should be offered multiple integrative learning experiences throughout the course of

their studies (Association of American Colleges and Universities & The Carnegie Foundation, 2004). This is only one such experience for a limited number of students. It is important to note that the BBN session was the 9th of 10 sessions in the module and learning from other aspects of the module will have influenced student performance and learning in the BBN role-play.

Our study found that students developed awareness of the broader view offered by an interdisciplinary team approach and appreciated the input of the other discipline in terms of the support it gave them and the potential it provided to improve patient care and the opportunity it provided to learn. The work on BBN role-play by Wakefield, Cocksedge & Boggis (2006) reported similar findings in relation to interdisciplinary teamwork. In addition, in the current study students reported having a clearer understanding of the roles of the disciplines in BBN and how to work with each other in a team. Students also reported learning from another discipline. In studies of education in BBN, few look at outcomes apart from students' or clinicians' perceptions of competence, satisfaction with teaching methods or measurement of communication skills. This study has broadened this perspective and found evidence that with appropriate supports, and in an interdisciplinary palliative care setting, the teaching of BBN has the potential to enhance student understanding of the practicalities of interdisciplinary teamwork and the benefits of this approach for patients, families and team members.

Huber and Hutchings (2004) describe self-awareness as an important aspect of integrative learning. We found evidence of increased self-awareness after the intervention. Some students reported that they felt better prepared to meet the communication challenge posed by BBN, while others indicated that they became more aware of their deficits and learning needs in this regard. These findings are also supported by those of a recent study by Layat Burn, Hurst, Ummel, Cerutti, and Baroffio (2014), who found evidence of increased self-awareness on follow up of students after a BBN teaching intervention that involved role-play. Hence further evidence is provided of the integrative learning potential of BBN role-play. It is the experience of facilitators that every year in IP3008 the BBN session also increases student awareness of the importance of self-care and this topic is covered in the debriefing at the end of the role-play and again in the final session of the module.

Learning about key principles of palliative care during the BBN session is supported by student feedback, including the importance of holistic care, family involvement, principles of non-abandonment and that palliative care is not end of life care. There was also evidence of increased understanding of how to communicate in the challenging circumstances of BBN.

Role-play is commonly used to teach communication skills in undergraduate and postgraduate healthcare education (Nestel & Tierney, 2007), and in particular as a method to teach BBN (Baile et al., 1999; Liénard et al., 2010; Park et al., 2010). The appropriateness of role-play as a teaching method for BBN teaching emerged strongly from both student and facilitator feedback.

The design of our role-play, both in terms of structure and content was firmly based in real life, and appears to have been successful in meeting learning outcomes and facilitating integrative learning. There is a considerable evidence that the role-play changed students' attitudes and perceptions and prompted "a type of knowing which results in people taking a personal interest in issues and wanting to effect change" (O'Sullivan, 2011, p. 536). Our research provides evidence of the potential for role-play in education to enhance self-awareness.

This study provides further evidence that students value and are willing to engage with properly supported role-play. The level of student engagement with, and contribution to the BBN exercise surprised experienced facilitators. These findings mirror those of Nestel and Tierney

(2007) who found evidence that students value the experience if provided with appropriate preparation and roles, opportunities to observe and discuss, and structured feedback. However, students do not always view role-play positively as an educational method. Lack of familiarity and understanding of the technique and previous bad experiences of role-play can provoke anxiety and unwillingness to participate (Nestel & Tierney, 2007; Stevenson & Sander, 2002). Multiple factors may have contributed to our students' positive attitudes. It is important to note that the BBN role-play was the third role-play in the module and was by far the most complex and challenging. The module design deliberately built up to this by exposing the students to a number of role-plays over the preceding weeks to prepare them for the BBN session. In addition, the prior presentation of the SPIKES model for BBN, the structure of the role-play itself and the inclusion of structured feedback are all likely to have provided a supportive environment where students were willing to participate.

Our finding that students struggled with teamwork aspects in the role-play is an important one. With the current focus on the need for interdisciplinary teamwork in healthcare, the question of whether we are adequately preparing graduates for this important aspect of practice is raised and should be the focus of future research.

Schön (1995) stated, "Perhaps there is an epistemology of practice that takes fuller account of the competence practitioners sometimes display in situations of uncertainty, complexity, uniqueness and conflict" (p. 29). Evidence from our study suggests that a well-constructed and supported interdisciplinary BBN role-play can be an effective teaching tool to support student learning and skill development in difficult communication skills and interdisciplinary teamwork.

VI. Conclusion

A well-designed interdisciplinary role-play of BBN based on real life practice allows for an authentic hands-on integrative teaching and learning encounter that is highly valued by students. Consideration should be given to increasing the number of such experiences in undergraduate healthcare education.

Acknowledgements

Appendices

Appendix A: Learning Outcomes for IP3008

On successful completion of this module, students should be able to:
Discuss the main principles of palliative care
Outline a basic approach to assess and manage common symptoms experienced by palliative care patients
Describe the fundamentals of ethics in palliative care

Identify the settings in which specialist palliative care services are delivered and know how to access these services

Describe the importance of holistic, collaborative, individualized care of patients and their families

Identify the key components of breaking bad news

Compare the palliative care approach with the traditional medical model of care

Argue the case for early referral to palliative care

Discuss the strengths, opportunities and challenges of interdisciplinary education and healthcare practice

Appendix B: Overview of IP3008 Teaching Sessions

IP3008 2013/14	
Session (date)	**Topic**
1 (Sept 18)	Overview of module Anna's story: DVD and discussion Role-play: team building exercise Optional tour of Hospice
2 (Sept 25)	Principles of Palliative care Lecture Inter disciplinary teamwork – Stereotyping exercise 1 hour
3 (Oct 2)	Teamwork Lecture Fishbowl role-play: interdisciplinary team act out a team meeting for students Role-play students play interdisciplinary team at a patient discharge planning meeting
4 (Oct 9)	Case Study in small groups part 1
5 (Oct 16)	Care of Dying Patient and their Family
6 (Oct 23)	Case Study in small groups part 2
7 (Oct 30)	Total Pain Lecture Real Patient Interview
8 (Nov 6)	Case Study in small groups part 3
9 (Nov 13)	BBN/Communication Workshop
10 (Nov 20)	Self Care Lecture Module debriefing & feedback

Appendix C: Breaking Bad News Scenario
Part 1: All participants in role-play and facilitator
Mary is a 43-year-old married lady with advanced malignant melanoma. She is currently an in-patient on the oncology ward. Her disease dates back over three years and she has undergone multiple lines of therapy. Recent investigations confirm extensive and progressive burden of disease affecting lungs, liver and lymph nodes. Currently, Mary is profoundly fatigued and requires assistance with all ADLs. She is deeply jaundiced but denies any pain. She is oxygen dependent. Her prognosis is limited to a few days or at best, perhaps a few short weeks.

Mary is married to Peter and they have three children - Jack (12), Emily (9) and Becky (5). All three children attend the local national school. Peter is a secondary school teacher and Mary had previously worked as a nurse in a general practice setting. She has not worked as a nurse since

her diagnosis. They have excellent support from Mary's parents (Tom & Betty) who are actively involved in the care of the children. Also, Mary's only sister Claire has recently returned from Australia for an 'extended holiday'. Peter has no siblings in Ireland and both of his parents have died in recent years.

Mary coped with her illness by 'being positive'. She actively researched her disease and all treatment options. She views 'negativity' as a failing and despite her massive burden of disease, continues to express a desire for more treatment – 'what have I got to lose?' Peter reports that the children are manifesting signs of distress with frequent illness (tummy pain) and the youngest Becky (5) has developed nocturnal enuresis. Peter has separately asked for some help and advice re preparing the children.

Today's meeting was arranged to discuss the situation and to advise Mary that there are no further treatment options other than pain and symptom management. Mary declined the suggestion that Peter should be in attendance – 'He's too busy with work and the children – I don't want to burden him.' Mary has indicated that she would like to meet with the oncology doctor and the nurse who has looked after her since her first diagnosis.

Part 2: Nurse, role player and facilitator only
You (the nurse) have cared for Mary since her initial diagnosis. You feel very close to her and she has confided a lot in you over the years. She trusts you.

You are very acutely aware of a discussion that took place nine months ago when Mary was very unwell with overwhelming sepsis. It was not at all clear if she would survive. You were nursing her at the time and she spoke with you about her fears of dying and of leaving Peter and the children. She reported that Peter is not a natural parent and that he has little patience with the children. She volunteered that her parents know of his shortcomings and try to help whenever they can.

She also volunteered that her marriage went through a very rocky phase around the time of her diagnosis. Peter had at least one affair that he acknowledged and Mary was frightened that he might set up a relationship with this woman following her death. Mary does not like the woman and would hate for her to be caring for her children. She has not discussed this with her parents or sister, as she does not want to turn them against Peter.

She is also struggling with the 'why me' question and volunteered that as a teenager, she had impulsively once made a half–hearted attempt on her own life. She wondered if her disease was a punishment from God for acting in this way.

More recently, Mary reported to you that she feels the children are aware that she is ill but they have no idea that she might die. They bring in drawings depicting their Mum as 'superman' or as a Queen. Mary feels guilty that she has not been available to her children as a mother should over the past three years – 'what good am I to my children – I can't do any of the normal things. I think that they might be better off without me. I'm not a normal mother or wife. I don't really blame Peter for the affair – any man would do the same.'

Appendix D: Facilitator Feedback Questionnaire on BBN Role-play
1. As a facilitator how effective did you find the structure of the scenario to engage students in the role-plays?
2. How did students demonstrate their understanding (or lack of understanding) of how to work as an interdisciplinary team?

3. In what ways, if any, did the nurse demonstrate understanding of teamwork in the divulging of information that only he/she knew about the patient's circumstances to the doctor?
4. In what ways, if any, did the students demonstrate an understanding of fundamental palliative care principles?
5. Regarding the Role-plays:
    a) In what ways were you satisfied or dissatisfied with how students played out the Breaking of Bad News?
    b) What challenges did you notice for students in their breaking of bad news?
    c) What do we learn from these role-plays about the challenges students face in breaking bad news?
    d) What are the implications of this learning for future education?
6. Comment on how you found the teamwork aspect of the role-plays?
7. Student feedback indicates that they really value and like the session but that they find BBN difficult. Do you have any ideas on how we could support students further?
8. What surprised you?

Appendix E. Student BBN Role Play Feedback Questionnaire
What impact did the role-play have on your understanding of breaking bad news?
What impact did the role-play have on your understanding of palliative care?
What impact did the role-play have on your understanding of interdisciplinary teamwork?
What surprised you?

References

Association of American Colleges and Universities and The Carnegie Foundation. (2004). *A Statement on Integrative Learning.* Retrieved from http://www.evergreen.edu/washingtoncenter/docs/intlearning/statementintlearning.pdf

Baile, W. F., Kudelka, A. P, Beale, E.A., Glober, G. A., Myers, E.G., Greisinger, A. J., … Lenzi, R. (1999). Communication skills training in oncology. Description and preliminary outcomes of workshops on breaking bad news and managing patient reactions to illness. *Cancer*, *86*(5), 887-897. doi: 10.1002/(SICI)1097-0142(19990901)86:5<887::AID-CNCR27>3.0.CO;2-X

Baile, W.F., Buckman, R., Lenzi, R., Glober, G., Beale, E. A. & Kudelka, A. P. (2000). SPIKES-A six-step protocol for delivering bad news: application to the patient with cancer. *Oncologist, 5*(4)*,* 302-311. doi: 10.1634/theoncologist.5-4-302

Berwick, D. M. (2002). A user's manual for the IOM's 'Quality Chasm' report. *Health Affairs, 21*, 80-90. doi: 10.1377/hlthaff.21.3.80

Bolton, G. M., & Heathcote, D. (1999). *So you want to use role-play?: A new approach in how to plan.* Stoke-on-Trent: Trentham.

Buckman, R. (1984) Breaking bad news: why is it so difficult? *British Medical Journal, 288,* 1597–1599. doi: 10.1136/bmj.288.6430.1597

Centre for the Advancement of Interprofessional Education. (2002). Defining IPE. Retrieved from http://caipe.org.uk/about-us/defining-ipe/

Carnegie Foundation. (2004). What is Integrative Learning? *Carnegie Foundation* Retrieved from http://gallery.carnegiefoundation.org/ilp/what-is-ILP.htm

Dando, N., d'Avray, L., Colman, J., Hoy, A., & Todd, J. (2012). Evaluation of an interprofessional practice placement in a UK in-patient palliative care unit. *Palliative Medicine, 26*(2), 178-184. doi: 10.1177/0269216311400479

Dickinson. GE. (2006). Teaching end-of-life issues in US medical schools: 1975 to 2005. *American Journal of Hospice and Palliative Care, 23*(3), 197-204. doi: 10.1177/1049909106289066

European Association for Palliative Care. (2004). *A guide for the development of palliative nurse education In Europe.* Palliative Nurse Education: Report of the EAPC Task Force 20. Retrieved http://www.eapcnet.eu/LinkClick.aspx?fileticket=e9JnEa7YZDM%3d

European Association for Palliative Care. (2013). *Recommendations of the European Association for palliative care for the development of undergraduate curricula for palliative medicine in European medical schools.* Retrieved from http://www.palliatief.nl/Portals/31/publicaties/2013-11-25EAPC_UndergraduateCurriculumUpdate2013.pdf

General Medical Council. (2009). *Tomorrows doctors: Outcomes and standards for medical education.* Retrieved from http://www.gmc-uk.org/education/undergraduate/tomorrows_doctors_2009.asp

Gibbins, J., McCoubrie, R., Maher, J., Wee, B., & Forbes, K. (2010). Recognizing that it is part and parcel of what they do: teaching palliative care to medical students in the UK. *Palliative Medicine, 24*(2), 299-305. doi: 10.1177/0269216309356029

Head, B. A., Schapmire, T., Hermann, C., Earnshaw, L., Faul, A., Jones, C., Shaw, M. A., … Pfeifer, M. (2014). The Interdisciplinary Curriculum for Oncology Palliative Care Education (iCOPE): Meeting the challenge of interprofessional education. *Journal of Palliative Medicine 17*(10), 1107-1114. doi: 10.1089/jpm.2014.0070.

Higgs, B., Kilcommins, S., & Ryan, T. (2010). *Making connections: Intentional teaching for integrative learning.* Cork: NAIRTL.

Huber, M. T., & Hutchings, P. (2004). *Integrative learning: Mapping the terrain.* Washington, DC: Association of American Colleges and Universities.

Institute of Medicine. (2013). *Best care at lower cost: The path to continuously learning health care in America.* Washington, DC: The National Academies Press.

Jessup, R. L. (2007). Interdisciplinary versus multidisciplinary care teams: Do we know the difference. *Australian Health Review, 31*(3), 330-331. doi:10.1071/AH070330

Legatt, S. (2007). Effective healthcare teams require effective team members: Defining teamwork competencies. *BMC Health Services Research 7*(17). doi: 10.1186/1472-6963-7-17

Layat Burn, C., Hurst, S. A., Ummel, M., Cerutti, B., & Baroffio, A. (2014). Telling the truth: Medical students' progress with an ethical skill. *Medical Teacher, 36*(3), 251-259. doi: 10.3109/0142159X.2013.853118.

Liénard, A., Merckaert, I., Libert, Y., Bragard, I., Delvaux, N., Etienne, A. M., … Razavi, D. (2010). Is it possible to improve residents breaking bad news skills? A randomised study assessing the efficacy of a communication skills training program. *British Journal of Cancer, 103*(2), 171-177. doi: 10.1038/sj.bjc.6605749

Metettal, G. (2002). The what, why and how of classroom action research. *The Journal of the Scholarship of Teaching and Learning*, *2*(1) 7-13.

Nestel, D., & Tierney, T. (2007). Role-play for medical students learning about communication: Guidelines for maximising benefits. *BMC Medical Education, 7*(3). doi:10.1186/1472-6920-7-3

Norton, L.S. (2009). *Action Research in Teaching and Learning: A practical guide to conducting pedagogical research in universities.* London: Routledge.

O'Sullivan, C. (2011) Role-Playing. In L. Cohen, L. Manion and K. Morrison (Eds.), *Research methods in education* ,7th edition (pp. 536-554) London: Routledge.

Park, I., Gupta, A., Mandani, K., Haubner, L., & Peckler, B. (2010). Breaking bad news education for emergency medicine residents: A novel training module using simulation with the SPIKES protocol. *Journal of Emergency Trauma Shock, 3*(4), 385-388. doi: 10.4103/0974-2700.70760

Parry, M. (2011). Student nurses' experience of their first death in clinical practice. *International Journal of Palliative Nursing, 17*(9), 446-51. doi: 10.12968/ijpn.2011.17.9.448

Plsek, P. E., & Greenhalgh, T. (2001). The challenge of complexity in health care. *British Medical Journal*, *323*(7313), 625–628. doi: 10.1136/bmj.323.7313.625

Schön, D. A. (1995). Knowing in action: The new scholarship requires a new epistemology. *Change.* Nov/Dec 27-34. doi: 10.1080/00091383.1995.10544673

Sellers, S. C. (2002). Testing theory through teaching theatrics. *Journal of Nursing Education, 41,* 498-50.

Speck, P. (2006). *Teamwork in palliative care: Fulfilling or frustrating.* New York: Oxford University Press. doi: 10.1093/acprof:oso/9780198567745.001.0001

Sweeney, C., O'Sullivan, E. & McCarthy, M.

Stevenson, K., & Sander, P. (2002). Medical students are from Mars–business and psychology students are from Venus–University teachers are from Pluto? *Medical Teacher, 24*(1), 27-31. doi:10.1080/00034980120103441

Wakefield, A., Cocksedge, S., &Boggis, C. (2006). Breaking bad news: qualitative evaluation of an interprofessional learning opportunity. *Medical Teacher, 28*(1)*,* 53-8. doi: 10.1080/01421590500312805

Wee, B., Hillier, R., Coles, C., Mountford, B., Sheldon, F., & Turner, P. (2001). Palliative care: a suitable setting for undergraduate interprofessional education. *Palliative Medicine, 15*(6)*,* 487-92. doi: 10.1191/026921601682553978

World Health Organisation. Definition of palliative care. *World Health Organisation.* Retrieved from http://www.who.int/cancer/palliative/definition/en/

World Health Organisation. (1996). *Physician education In palliative medicine: A vehicle to change the culture of pain management.* Retrieved from http://www.whocancerpain.wisc.edu/?q=node/275

World Health Organisation. (2010). *Framework for action on interprofessional education & collaborative practice.* Geneva. Retrieved from http://www.who.int/hrh/nursing_midwifery/en/

Attitude to the study of chemistry and its relationship with achievement in an introductory undergraduate course

Stephen J. Brown[1], Sue White[2], Bibhya Sharma[3], Lara Wakeling[4], Mani Naiker[5], Shaneel Chandra[6], Romila Gopalan[7], & Veena Bilimoria[8]

Abstract: A positive attitude to a subject may be congruent with higher achievement; however, limited evidence supports this for students in undergraduate chemistry – this may result from difficulties in quantifying attitude. Therefore, in this study, the Attitude to the Study of Chemistry Inventory (ASCI) – a validated instrument to quantify attitude, was used to measure attitude to chemistry in 125 undergraduates studying an introductory course in chemistry, as part of a BSc Chemistry major. The 13 week course contained 4 summative assessments: practical (PRAC), tutorial (TUT), on-line web-based learning (OWL), and a final exam (FE). Sub-scales within ASCI which quantify the 'affective' and 'cognitive' components of attitude were determined. Firstly, for all 125 students, weak correlations (r) between the affective scale score and FE (r=0.275, P<0.01) and TOTAL (r=0.228, P<0.05), were recorded. Secondly, a low achieving (LA, n=48) and a high achieving (HA, n=77) group were identified using a cluster analysis procedure. The HA group scored higher than the LA group in PRAC, OWL, FE and TOTAL (all P<0.001), but the clusters were not different in their scores for either the affective or the cognitive components of attitude. There was no correlation between attitude and achievement in the HA group, and only one weak positive correlation (0.409), between the affective score and achievement in the LA group. We suggest that although a positive attitude may be an important part of the undergraduate experience, it is at best only weakly associated with achievement in undergraduate chemistry.

Keywords: attitude, chemistry education research, testing and assessment, achievement.

I. Introduction

A positive attitude may be congruent with higher achievement at university (Osborne, Simon, & Collins, 2003; Xu & Lewis, 2011; Xu, Southam, & Lewis, 2012), however, there is a paucity of data pertaining to the importance of attitude in undergraduates majoring in chemistry

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[1] Auckland University of Technology, Auckland, NZ, stbrown@aur.ac.nz
[2] Auckland University of Technology, Auckland, NZ, suwhite@aut.ac.nz
[3] School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, University of the South Pacific, Laucala Campus, Suva, Fiji, bibhya.sharma@usp.ac.fj
[4] Federation University, Mount Helen, VIC, 3350, Australia, L.wakeling@feduni.edu.au
[5] Federation University, Mount Helen, VIC, 3350, Australia, m.naiker@feduni.edu.au
[6] School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, University of the South Pacific, Laucala Campus, Suva, Fiji, shaneel.chandra@usp.ac.fj
[7] School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, University of the South Pacific, Laucala Campus, Suva, Fiji, romila.devi@usp.ac.fj
[8] School of Biological and Chemical Sciences, Faculty of Science, Technology and Environment, University of the South Pacific, Laucala Campus, Suva, Fiji, veena.bilimoria@usp.ac.fj

(Bauer, 2008; Xu & Lewis, 2011). Developing a positive attitude towards a subject may be an important component of the undergraduate experience, and as educators, we may encourage students to have a positive attitude, yet the concept of an attitude towards the study of chemistry is somewhat vague. It has been proposed (Bagozzi & Burnkrant, 1979) that attitude could be viewed as a two-component construct, comprised of cognitive and affective components. As such, attitude has been described as a tendency to respond to a certain stimulus, for example, the study of chemistry, where the response has both a cognitive (what do I *think* about studying chemistry?) and an affective (how do I *feel* about studying chemistry?) dimension (Rosenberg & Hovland, 1960). Affective reflects emotional responses through individual preferences to the stimulus, whereas the cognitive reflects an individual's beliefs and knowledge about the stimulus (Xu, Southam, & Lewis, 2012).

A students' attitude is of concern to the educator as it may influence the students' engagement with course material, connectedness with peers (and the institution), and possibly, academic achievement and progression through an undergraduate programme (Handelsman et al., 2005; Miller et al., 1996). To assess the influence of attitude on the study of chemistry in an undergraduate curriculum, appropriate and valid instruments to quantify attitude, and the components of attitude, have been developed. For example, the Chemistry Expectations Survey – CHEMX (Grove & Bretz, 2007), Chemistry Attitudes and Experiences Questionnaire – CAEQ (Coll, Dalgety, & Salter, 2002), and the Colorado Learning Attitudes about Science Survey – CLASS (Barbera et al., 2008; Heredia & Lewis, 2012) are tools that have been used to quantify attitude to the study of chemistry in undergraduate students. Also, the Attitude to the Study of Chemistry Inventory – ASCI (Bauer, 2008; Xu & Lewis, 2011; Brown et al., 2014), and the shortened version – ASCIv2 (Xu, Southam, & Lewis, 2012; Brandriet et al., 2011) may also be suitable tools to quantify attitudes to chemistry in undergraduate students. In previous studies which used exploratory factor analysis, and subsequent confirmatory factor analysis, both ASCI and ASCIv2 have consistently been shown to contain two sub-scales congruent with the affective and cognitive components of attitude.

Although there is a complex relation between attitude and achievement (Freedman, 1997; Steiner & Sullivan, 1984), the limited previous work on chemistry majoring students has suggested that associations between both the cognitive and affective components of attitude, and academic performance were weak (Bauer, 2008). For example, a correlation of 0.39 between 'Intellectual Accessibility (cognitive)' and course grade has been reported (Bauer, 2008), while others (Xu & Lewis, 2011) reported correlations between achievement and both cognitive and affective components of attitude as 0.30 and 0.34, respectively. Although significant correlations between achievement and attitude were reported in students majoring in chemistry at university (Brandriet et al., 2011), the strength of these associations was poor. These weak correlations between attitude and achievement may suggest that attitude is independent of, or at best, only weakly associated with achievement in an undergraduate course in chemistry.

Therefore, the aims of the current study were firstly, to investigate the relation between attitude and achievement in chemistry majoring students studying a first year course in introductory chemistry, and secondly, to investigate the relation between attitude and achievement in those students identified as low achieving and high achieving within the same group. We hypothesised that weak associations between attitude and achievement would prevail in the full sample, but there would be stronger associations in a sub-group of higher achievers.

II. Methods

This study received approval from the host institution Ethics Committee, a requirement of which was to obtain written permission of each participating student to access their grades and assessment scores. Students' marks for each assessed component were entered into a spread-sheet alongside their responses to the Attitude to the Study of Chemistry Inventory (ASCI). For a full description of this instrument, see Bauer (2008). This instrument, in paper format, was distributed to students by an impartial observer during routine class times. Students were required to identify their completed ASCI by their student number – a unique identifier for that student and specific to the host institution, prior to collection by the same observer.

The ASCI was administered in week 7 of the 13 week course. This time point was chosen as it has an advantage of including students who are late in their course enrolment, but avoids those students who enrol on-time, yet switch to other courses in the first few weeks of the semester. We also assumed that by week 7 of the course, students were relatively settled in their work habits and were engaging with the material consistent with tutor expectations. Quantifying attitude mid-way through the course may also avoid capturing negative emotions which could be induced by a fear of final examinations.

Assessed components in the chemistry course were practical (PRAC), on-line web learning (OWL), tutorial (TUT), and final exam (FE) – collectively these contributed to the total mark for the course (TOTAL). The course contained theoretical and experiential learning, with supporting material provided in lecture, tutorial, and practical settings consistent with a modern, large scale publicly funded university. Throughout the 13 week course, students were given marking rubrics for assessed work, and feedback on assessed components (with the exception of the final exam) within two weeks of submission.

III. Data analysis

On completed ASCI forms, scale reversal was carried out on ASCI items 1, 3, 6, 7, 9, 11, 12, 14, 15, and 18, thus allowing all 'negative' terms to be chosen with 1 as the response, and all 'positive' terms to be chosen with a 7 response. Four items constituted the cognitive sub-scale: these were 1, 4, 5, and 10. Items which constituted the affective sub-scale were 7, 11, 14, and 17. For each respondent, scores for the items on each sub-scale were summed, thus giving a single value for that scale (maximum score = 28). The relation between the scores for affective and cognitive sub-scales, and assessed components, was determined for all respondents (n=125) using the Pearson correlation coefficient. A twostep cluster analysis was used to identify if groupings existed within the data (Kaufman & Rousseeuw, 2005) – this is an exploratory tool designed to reveal natural groupings (or clusters) within a data set that would otherwise not be apparent. When clusters were identified, further correlations between attitude and achievement were carried out, with data from each cluster. All statistical procedures were carried out using appropriate software (IBM SPSS Statistics 19).

IV. Results

There were 125 complete sets of data, each comprising a mark for all assessed components and completed ASCI. Students not returning a mark for any assessed component and students which received credit for prior learning were excluded from the analysis. The relations

between the assessment scores and components of attitude were explored using Pearson correlation, and this was done for the entire group, and the separate clusters (data shown in table 1).

Table1

Attitude versus achievement in undergraduate chemistry majoring students. Data shown are the Pearson correlation coefficients for the entire cohort (n=125), and the Low Achieving (n=48) and High Achieving (n=77) clusters.

		TUT	PRAC	OWL	FE	TOTAL
All students (n=125)	cognitive	-.046	-.017	.150	.160	.170
	affective	-.162	-.073	.128	.275[**]	.228[*]
Low Achieving (n=48)	cognitive	-.126	-.057	-.054	.187	.087
	affective	-.245	-.182	-.152	.409[**]	.162
High Achieving (n=77)	cognitive	.007	-.176	.151	.017	.082
	affective	-.104	-.184	.162	.152	.176

* P<0.05, **P<0.01

The two-step cluster analysis identified two clusters (see figure 1), which have been described as low achieving (LA, n=48) and high achieving (HA, n=77), with a cluster ratio of 1.6.

Table 2

Mean (SD) values for each variable in the entire group, and the two clusters. Values were compared between the clusters using unpaired Student t-tests. Key: practical (PRAC), on-line web based learning (OWL), tutorial (TUT), final exam (FE), total mark (TOTAL).

	entire cohort (n=125)		Low Achieving (n=48)		High Achieving (n=77)	
	mean	SD	mean	SD	mean	SD
TUT	80.9	12.1	81.3	12.6	80.7	11.8
PRAC	92.1	12.4	84.9*	15.5	96.7	6.8
OWL	27.9	6.9	21.4*	5.6	31.9	3.8
FE	24.5	8.8	16.0*	5.2	29.7	6.1
TOTAL	52.4	14.6	37.4*	8.4	61.7	8.6
Cognitive	13.8	3.9	13.0	3.6	14.3	4.0
Affective	20.0	3.8	19.3	3.7	20.5	3.8

* P<0.001
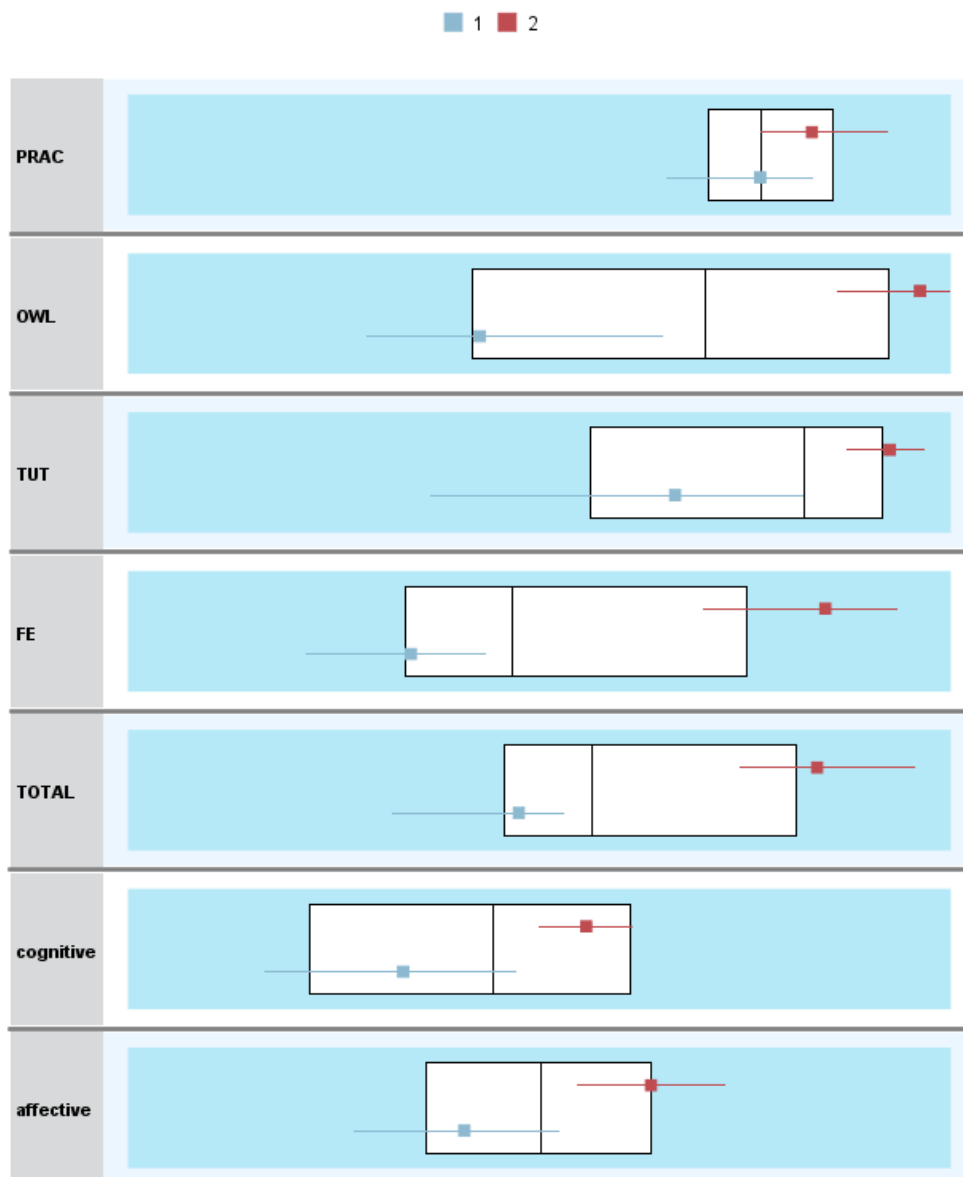
Figure 1. Cluster analysis of student achievement and attitude in undergraduate first year chemistry. For each input variable, the open white box indicates the range between the upper and lower quartile, with the central line indicating the median value. Two clusters were identified: a low achieving group (1, solid blue square with blue whiskers) and a high achieving group (2, solid red square with red whiskers). Inputs are normalised (0 – 100 %) and include practical (PRAC), on-line web based learning (OWL), tutorial (TUT), final exam (FE), total mark (TOTAL), and cognitive and affective components of attitude.

When the two clusters were compared in terms of their assessment scores, the HA cluster scored significantly higher in the assessed components: PRAC, OWL, FE, and TOTAL (see table 2).
    When the scores for both cognitive and affective components of attitude were compared between the low achieving and the high achieving cluster, there was no significant difference

between clusters. Thus, although membership of a cluster could be predicted from most of the achievement scores (with the exception of tutorial score), components of attitude had little or no effect on determining cluster membership.

V. Discussion

In this study, we were interested in the relation between attitude and achievement in a sample of university students studying introductory chemistry as part of a BSc chemistry major. The questionnaire we used to quantify attitude contained two sub-scales – these quantified the affective component and the cognitive component of attitude. We also used five summative assessment scores to represent a student's achievement on the course. Our study uniquely reports a twostep cluster analysis which identified a low achieving and a high achieving cluster, and for both clusters, components of attitude (both cognitive and affective) were not different. A further unique finding was that the two clusters could be distinguished by the majority of the achievement scores, but not by the attitude scores. Also, when the initial group was separated into the high achieving and low achieving clusters, the only significant positive correlation was between the affective score and achievement in the final exam in the low achieving group. Thus, the findings of our study suggest that there was no clear association between achievement and attitude in undergraduates studying chemistry – a finding consistent with previous reports (Bauer, 2008; Brandriet et al., 2011; Xu & Lewis, 2011) on similar student groups.

The first aim of this study was to investigate the relation between attitude and achievement in undergraduate students undertaking an introductory course in chemistry. This aim was dependent on the efficacy and validity of the instrument we chose to quantify attitude. The ASCI has been shown to be a valid instrument to quantify attitude, with an internal structure consistent with the affective and cognitive components of attitude, and thus fitting with the theoretical composition of attitude. Exploratory factor analysis of the data obtained using ASCI (Bauer, 2008) initially indicated latent factors which included intellectual accessibility (concordant with 'cognitive'), emotional satisfaction and anxiety (concordant with 'affective'). Further studies (Brown et al., 2014; Xu & Lewis, 2011; Xu, Villafane, & Lewis, 2013) have confirmed this internal data structure, by consistently showing that both affective and cognitive sub-scales are contained within ASCI. Thus, we are confident that the instrument used to quantify attitude was appropriate and valid for this group of students.

Higher scores obtained for the affective and cognitive sub-scales may indicate a more positive attitude to chemistry. However, the weak correlation between attitude and achievement in this study suggested that a student's achievement in this introductory chemistry course was independent of the student's attitude. It is unlikely that an instrument purporting to measure attitude would exhibit a very strong correlation with achievement, as this would suggest the instrument is simply another measure of content knowledge. We suggest that it was unlikely that students on this course were ambivalent in their attitude to the study of chemistry, as all students had chosen to study a named BSc major in chemistry. However, the motivation behind the choice to study chemistry was not investigated in this study, and thus it may be possible that external factors (for example, parental and/or financial pressures) strongly influenced subject choice at university. Although speculative, we suggest that external factors which influence subject choice at university may impact attitude to that choice without affecting achievement on an introductory course. The lack of a strong, positive correlation between measures of attitude and achievement in undergraduate chemistry is consistent with previous research, although few

studies which report a change in attitude among students indicate the effect of this change on achievement (Berg, 2005). We suggest that further analysis of the possible relation between attitude and achievement in undergraduates studying a chemistry major should identify those students in which a change in attitude has been identified.

Although ASCI did not require content knowledge in chemistry, it assumes a familiarity with the terms used for each item, and a misunderstanding of the terms may lead to error. In the current study, all participants were studying in the English language, however, the culture-inclusive curriculum and diversity of a modern, large publicly funded university pre-disposes the student cohort to be multi-lingual (Brown et al., 2014). Thus, it is possible that participants in this study assigned different meanings to some of the terms used in the ASCI, and this may restrict the use of a semantic differential instrument in such a multi-lingual population. The ASCI was administered in week 7, however, this timing was subjective and may have influenced our measurement of attitude. It is likely that a student's attitude will change as they progress through a course, and be influenced by events such as examinations and test scores. Further research is required to determine the consistency of attitude scores (both cognitive and affective) obtained using the ASCI instrument throughout a course with multiple and varied assessment points. For example, the short term influence of an examination on attitude may be of interest as it is likely that success (or failure) in a summative assessment will influence attitude. Alternatively, the consistency and robustness of attitude may ensure that measures obtained using ASCI are unaffected by short term influences during the 13 week course.

Our second aim was to investigate relations between attitude and achievement in groups of high achieving and low achieving students. In the current study, identifying two clusters with the cluster analysis enabled us to determine a low achieving and a high achieving group, and this represents a unique approach to the study of attitude and achievement in undergraduate chemistry. These clusters could be separated by achievement scores, but not by attitude scores, thus suggesting that attitude (both the cognitive component and the affective component) was similar regardless of cluster. There were consistently low correlations between measures of achievement and attitude in both clusters, and therefore we reject the statement "… there would be stronger associations in a sub-group of high achievers" which formed part of our hypothesis. Thus, although having (or developing) a positive attitude to study may be an important part of the undergraduate experience, there is little evidence to support any strong relations between attitude and achievement in this introductory chemistry course.

In the current study, we chose to adopt a cluster analysis approach to identify groupings within our data – membership of the group was determined by scores on assessment tasks and the attitude subscale scores. Although both cluster analysis and discriminant analysis classify objects into categories, discriminant analysis requires prior knowledge of group membership (and therefore unsuitable in this study). In contrast, the goal of our cluster analysis was to identify the actual groups. Using the two-step cluster analysis technique, the number, size, and membership of a group is unknown at the outset. In the procedure, the first step assigns individuals to pre-clusters, and in the second step, these pre-clusters are grouped using a hierarchical clustering algorithm – this algorithm determines how many clusters are formed (Kaufman & Rousseeuw, 2005). In our study, the low and high achieving groups identified by the two-step cluster analysis could be distinguished by all achievement scores, however, it was possible that a student may be 'borderline' between clusters. The risk of allocating an individual to the wrong group is reduced by using all achievement scores (5 inputs) and both attitude sub-scale scores in the analysis. In future studies, we may adopt an a priori grouping, for example,

based on the previous year's attainment in all chemistry related subjects or on university entrance exam performance to study the influence of novel pedagogies designed to improve attitude in distinct groups.

In conclusion, this study has indicated that measures of attitude and the components of attitude (affective and cognitive), were independent of achievement in undergraduates majoring in chemistry. This independence was evident in both low and high achievers, when these groups were formed using a twostep cluster analysis. We suggest that further research into the possible relationships between attitude and achievement in undergraduate studies of chemistry include evidence of underlying motivators for this subject choice.

References

Gosser, D. K., & Roth, V. (1998). The workshop chemistry project: Peer-led team learning. *Journal of Chemical Education,* 75, 185-187. doi:10.1021/ed075p185.

Bagozzi, R.P., & Burnkrant, R.E. (1979). Attitude measurement and behaviour change: a reconsideration of attitude organization and its relationship to behaviour. *Advances in Consumer Research, 6,* 295-302. doi: 10.1108/13612021011046101

Barbera, J., Adams, W.K., Wieman, C.E., & Perkins, K.K. (2008). Modifying and validating the Colorado Learning Attitudes about Science Survey for use in chemistry. *Journal of Chemical Education, 85*(10), 1435-1439. doi: 10.1021/ed085p1435

Bauer, C.F. (2008). Attitude towards chemistry: A semantic differential instrument for assessing curriculum impacts. *Journal of Chemical Education*, *85*(10), 1440-1445. doi: 10.1021/ed085p1440

Berg, C. (2005). Factors relating to observed attitude change toward learning chemistry among university students. *Chemistry Education Research and Practice*, *6*(1), 1-18. doi: 10.1039/b4rp90001d

Brandriet, A.R., Xu, X., Bretz, S.L., & Lewis, J.E. (2011). Diagnosing changes in attitude in first-year college chemistry students with a shortened version of Bauer's semantic differential. *Chemistry Education Research and Practice*, 2011, 12, 271-278.

Brown, S.J., Sharma, B.N., Wakeling, L., Naiker, M., Chandra, S., Gopalan, R.D., & Bilimoria, V.B. (2014). Quantifying attitude to chemistry in students at the University of the South Pacific. *Chemistry Education Research and Practice*, *15*, 184-191. doi: 10.1039/c3rp00155e

Coll, R.K., Dalgety, J., & Salter, D. (2002). The development of the chemistry attitudes and experiences questionnaire (CAEQ). *Chemistry Education Research and Practice in Europe*, *3*(1), 19-32. doi: 10.1039/b1rp90038b

Freedman, M.P. (1997). Relationships among laboratory instruction, attitude toward science, and achievement in science knowledge. *Journal of Research in Science Teaching*, *34*(4), 343-357. doi: 10.1002/(SICI)1098-2736(199704)34:4<343::AID-TEA5>3.0.CO;2-R

Brown, S.J., White, S., Sharma, B., Wakeling, L., Naiker, M., Chandra, S., Gopalan, R., & Bilimoria, V.

Grove, N.P, & Bretz S.L. (2007). CHEMX: Assessing students' cognitive expectations in learning chemistry. *Journal of Chemical Education*, *84*(9), 1416-1424. doi: 10.1021/ed084p1524

Handelsman, M.M., Briggs, W.L., Sullivan, N., & Towler, A. (2005). A measure of college student course engagement. *The Journal of Educational Research*, *98*(3), 184-191. doi: 10.3200/JOER.98.3.184-192

Heredia, K., & Lewis, J.E. (2012) A psychometric evaluation of the Colorado Learning Attitudes about Science Survey (CLASS) for use in chemistry. *Journal of Chemical Education*, *89*(4), 436-441. doi: 10.1021/ed100590t

Kaufman, L., & Rousseeuw, P.J. (2005). *Finding groups in data: An introduction to cluster analysis*. Wiley, Hoboken, NY.

Lovelace, M., & Brickman, P. (2013). Best practices for measuring students' attitudes toward learning science. *CBE – Life Sciences Education*, *12*, 606-617. doi: 10.1187/cbe.12-11-0197

Miller, R.B., Greene, B.A., Montalvo, G.P., Ravindran, B., & Nichols, J.D. (1996). Engagement in academic work: The role of learning goals, future consequences, pleasing others, and perceived ability. *Contemporary Educational Psychology*, *21*, 388-422. doi: 10.1006/ceps.1996.0028

Osborne, J., Simon, S., & Collins, S. (2003). Attitudes towards science: A review of the literature and its implications. *International Journal of Science Education*, *25*(9), 1049-1079. doi: 10.1080/0950069032000032199

Rosenberg, M.J., & Hovland, C.I. (1960). Cognitive, affective and behavioural components of attitudes. In M.J. Rosenberg & C.I. Hovland (Eds.) *Attitude organization and change: An analysis of consistency among attitude components*. New Haven: Yale University Press, USA.

Steiner, R., & Sullivan, J. (1984). Variables correlating with student success in organic chemistry. *Journal of Chemical Education*, *61*, 1072-1074. doi: 10.1021/ed061p1072

Xu, X., & Lewis, J.E. (2011). Refinement of a chemistry attitude measure for college students. *Journal of Chemical Education*, *88*, 561-568. doi: 10.1021/ed900071q

Xu, X., Southam, D., & Lewis, J.E. (2012). Attitude toward the subject of chemistry in Australia: An ALIUS and POGIL collaboration to promote cross-national comparisons. *Australian Journal of Education in Chemistry*, *72*, 32-36.

Xu, X., Villafane, S.M., & Lewis, J.E. (2013). College students' attitudes toward chemistry, conceptual knowledge and achievement: structural equation model analysis. *Chemistry Education Research and Practice*, *14*, 188-200. doi: 10.1039/c3rp20170h

Transformative learning of pre-Service teachers during study abroad in Reggio Emilia, Italy: A case study

Angela Vatalaro[1], Judit Szente[2], and Judith Levin[3]

Abstract: The present paper explores the transformative learning of five pre-service teachers participating in a two-week study abroad program to Reggio Emilia, Italy. The study was conducted in order to understand how a study abroad program could contribute to pre-service teachers' content knowledge, teaching practices, and global competence. Through a phenomenological research design, participants' lived experiences and the meanings they made of those experiences during study abroad were collected, analyzed, and coded. Conclusions, discussions, and recommendations for further research are also included.

Keywords: study abroad, pre-service teachers, global competence, teacher education

I. Introduction

Only a small percentage of pre-service teachers are exposed to meaningful, comprehensive curricula that enhance global competence (Lucas & Villegas, 2002; Tucker, 1982; Wells, 2008). In response to pre-service teachers' limited exposure to diverse curricula, many universities offer international study abroad programs that provide students with experiences designed to increase multicultural and global awareness that they may not receive in their regular coursework. This paper shares how a Study Abroad Program to Reggio Emilia, Italy transformed pre-service teachers' learning experiences.

The guiding research question for the study was: How do the lived experiences of pre-service teachers who travel to Reggio Emilia, Italy for study abroad transform students' perceptions and global competence? Student perceptions and global competence were measured by a demographic questionnaire, interview-style directed reflective journals, and a profile of a globally competent student. Findings indicate that students' perceptions and global competence were transformed in three areas: a) an increase in content knowledge of the Reggio Emilia Approach; b) views of cultural differences; and c) a heightened self-awareness after returning to the United States.

A. Global Competence

According to the National Education Association (NEA, 2010), global competence is a vital skill for all 21st Century Learners and higher educational institutions must find ways for pre-professionals—those who are in education programs prior to entering the workforce—to increase their global competence skills. The Council of Chief State School Officers and the Asia Society (Mansilla & Jackson, 2011) define global competence as "…the capacity and disposition to understand and act on issues of global significance" (p. xiii). Within this definition, global

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[1] Doctoral Student, University of Central Florida, angela.vatalaro@ucf.edu
[2] University of Central Florida, judit.szente@ucf.edu
[3] University of Central Florida, judith.levin@ucf.edu

competence is enhanced when students participate in and analyze experiences beyond the environment in which they interact with the most, identify diverse perspectives, present ideas to diverse people, and advocate for others. More specifically, NEA operationally defines global competence as "…the acquisition of in-depth knowledge and understanding of international issues, an appreciation of and ability to learn and work with people from diverse linguistic and cultural backgrounds, proficiency in a foreign language, and skills to function productively in an interdependent world community" (2010, p. 1). NEA further breaks this definition of global competence down into four components: (1) international awareness; (2) appreciation of cultural diversity; (3) proficiency in foreign languages; and (4) competitive skills. NEA believes these skills are necessary components of public education programs because the United States has become more diverse, relies more on other countries to boost the economy, and must address global health and environmental issues. Therefore, higher educational institutions must determine how the global competence skills of pre-service teachers can be fostered. For the purposes of this paper, both definitions of global competence and their characteristics will be adopted and will be discussed in relation to pre-service teachers.

B. Study Abroad Programs

Study abroad programs can be outstanding educational opportunities to increase global competence. They can provide pre-service teachers with additional real-world experiences working with others in varying socio-economic conditions and with those who speak different languages. Study abroad programs can also offer exposure to educational systems and teaching philosophies outside of the United States. Study abroad—or "global learning"—programs are defined as "a vehicle for integrating multiple disciplinary perspectives and weaving together existing commitments to explore diversity, build capacity for civic engagement, and prepare students to take responsibility for common global problems" (Hovland, 2009, p. 2). This definition aligns with the definitions of global competence as described earlier, especially in the areas of international awareness, appreciation of cultural diversity, and advocating for others.

Scholars have also indicated that study abroad programs have resulted in participants being able to identify more specific components of global competence such as the political, religious, economic, historical, and cultural diversity of children and families in the school community who come from different countries (Trilokekar & Rasmi, 2011). Study abroad experiences can be applied throughout an education program to synthesize, analyze, and evaluate existing course texts and activities within the context of what is experienced abroad (Hovland, 2009). Finally, global learning programs can be either short-term (up to a few weeks) or long-term (semester or year-long) and can range in experiences from learning about the food in a specific country to service-learning within schools.

C. Study Abroad as a Vehicle to Enhance Global Competence in Teacher Education Programs

Several patterns have emerged from the examination of the impact of study abroad programs on pre-service teachers' global competence. For example, Brindley, Quinn, and Morton (2009) investigated 17 elementary and early childhood pre-service teachers who spent 26 days teaching in England. Data using a qualitative approach were collected from the participants' reflective journals. The common emerging themes centered on the similarities and differences between the American and English education systems. The themes included "understanding of

community, responsibility and management in the classroom, the meaning of a broader curriculum, the role of technology and the universal characteristics of children" (Brindley et al., 2009, p. 250). The researchers concluded that a characteristic of the globally competent pre-professional is the ability to consider diverse methods of teaching and reflect upon how those methods apply to their career.

Another characteristic of the globally competent pre-service teachers that has emerged is the ability to adapt and become sensitive to other cultures. Williams (2005) investigated 55 college students of varying majors who studied abroad in different countries for at least four months. A control group of 48 students who did not study abroad was used for comparison. Pre- and post-study abroad survey data included "emotional resilience, flexibility and openness, perceptual acuity, and personal autonomy…[as well as] intercultural communication awareness" (p. 362). Williams concluded that "…exposure to various cultures is the best predictor of intercultural communication skills" (p. 369). Therefore, global competence increases the more a person participates in activities outside of their own culture. Trilokekar and Kukar (2011) reached a similar conclusion about students who studied abroad. Using a qualitative approach, Trilokekar and Kukar identified themes of racism, being an outsider, risk-taking, and realizing differences in social status between countries. Each of these themes requires a certain degree of cultural adaptability and sensitivity as defined by Williams (2005). Through recognizing and analyzing these disorienting experiences, globally competent pre-service teachers can begin to perceive diverse children as individuals and consider the difficulties these children may face when interacting within an unfamiliar culture.

D. Study Abroad as a Transformative Learning Process

Study abroad programs are considered to be a transformative process (Taylor, 2008; Trilokekar & Kukar, 2011; Wells, 2008). *Transformative learning theory* involves "constructing and appropriating new and revised interpretations of the meaning of an experience in the world" (Taylor, 2008, p. 5). A primary process of transformative learning theory is the understanding of experiences through reflection and conversations with others (Mezirow, 1996). Through deep reflection, the learner can begin to question, evaluate, and compare encounters in order to make sense of diverse experiences. Ultimately, the learner begins to apply experiences to prior knowledge and form new notions, or frames of reference, about the world and others in the world. Therefore, the transformative learning theory involves reflecting on and analyzing experiences in order to construct knowledge.

According to Mezirow (1997), a frame of reference acts as a preconception that guides a person's actions in a new experience. A frame of reference includes two components: habits of mind and point of view. Habits of mind comprise a set of abstract codes and values a person gains from their immediate environment. A habit of mind drives a person's point of view and, thus, their feelings and judgments towards others. Habits of mind tend to remain static, while points of view transform as a person has an experience that does not fit into their previously conceived points of view and is able to reflect critically on their previous assumptions (Mezirow, 1997). When working with adult learners, Mezirow (1978, 1997) believes that transformative learning is supported when the learner is aware and can critically analyze theirs and others' frames of reference, can examine beliefs and experiences from different perspectives, and can engage in discussion to support or reject current frames of reference. Consequently, learning is transformed through making meaning of social experiences (Mezirow, 1997).

From the perspective of studying abroad, upon experiencing a diversity of ideas, language, and culture and then reflecting on that experience, the pre-service teachers can begin to transform preconceptions about others into an inclusive, globally competent context (Trilokekar & Kukar, 2011). Thus, the pre-service teacher who reflects on the study abroad experience forms new global perspectives that can inform teaching practice and strengthen global competence. Based on the above, the purpose of the present study is to explore such transformative learning processes of pre-service teachers during a Study Abroad Program in Reggio Emilia, Italy.

E. The Study Abroad Program to Reggio Emilia, Italy

The Reggio Emilia Approach (afterwords referred to as "the Approach") offers a unique perspective to the developmentally appropriate practices defined by the National Association for the Education of Young Children (NAEYC, 2009), including the role of the teacher as a facilitator who guides children as they take charge of their learning within an emergent curriculum. Although the Approach is not the only teaching philosophy used in the town of Reggio Emilia, it has been closely studied by Early Childhood educators around the world. While the Approach is often described in Early Childhood textbooks as an "influence [that] has challenged our thinking about art for young children. . ." (Essa, 2007, p. 267), the information included in texts is very limited in scope -leaving the reader to conclude that the main component of the Approach is student engagement and learning through art-based activities.

However, while art is used to enhance learning and expression in Reggio classrooms, the foundations of the Approach are based on strong child, teacher, family, and community relationships, with long-term community-based critical and creative thinking projects evolving from those interactions (Edwards, Gandini, & Forman, 2012). A major tenant of the Reggio Emilia Approach is that education is based on relationships within "…a school that is active, inventive, livable, documentable, and communicative…a place of research, learning, revisiting, reconsideration, and reflection" (Malaguzzi, 1993, p. 9). In this sense, teachers and parents learn from and along with the children. This is achieved through constant communication between the three systems (children, teachers, and parents).

Structuring the majority of learning experiences for children to work in small groups is also an important aspect of the Reggio Emilia Approach. In the context of The Approach, allowing children to interact with each other and their environment in ways that are not highly structured will facilitate the growth of all domains of development. Thus, it is the teacher's job to observe children as they interact with each other and with the materials they are given so that teachers can determine what materials or responses are needed to help foster communication among the children (Malaguzzi, 1993). As the teacher observes the children, continuous documentation in the form of written behaviors and children quotes, photographs, and videos is conducted and used to inform teachers' guidance of children's learning. Documentation panels are printed and placed on walls around the whole school for children, parents, and visitors to understand the processes of the children's learning.

The Early Childhood Development and Education (ECDE) program at a large southeastern public university collaborated with the campus's Office of International Studies to create a study abroad program to Reggio Emilia, Italy during Summer 2012 entitled *Historical, Cultural, and Theoretical Foundations of the Reggio Approach to Early Childhood in Italy*. The study abroad program was designed to provide a deeper exploration into the Approach in order to offer pre-service teachers the opportunity to gain hands-on, real-world educational and

cultural experiences within the context of developmentally appropriate practices that cannot be obtained from reading a textbook or enrolling in non-study abroad courses. Participants had the opportunity to visit early childhood and cultural centers in Italy and compare them with centers in the United States. This was the first time current ECDE faculty at this university planned and carried out a study abroad program to schools that use the Approach. The program was open to all majors at this university.

II. Research Design and Guiding Question

A qualitative, phenomenological research design was chosen for the study. The goal of phenomenological research is to depict the meanings participants give to lived experiences (Creswell, 2007). In a phenomenological study, the researcher often conducts interviews and observations to gain in depth insight into participants' experiences. Data analysis is conducted as participants are experiencing the phenomena. In the present study, participants' responses were repeatedly reviewed throughout the study. Through the phenomenological process of horizontalization (Gall, Gall, & Borg, 2007) significant statements relevant to the participants' experiences and global competence were highlighted. Then, the statements were clustered into common themes that all participants experienced. Data was then presented as a list of themes with detailed descriptions and quotes from participants' responses to further represent the themes (Hays & Wood, 2011).

Because participants' responses and experiences drive a phenomenological study, an overall research question is formed to help guide the study (Creswell, 2007). The guiding question for the current study was: How do the lived experiences of pre-service teachers who travel to Reggio Emilia, Italy for study abroad transform students' perceptions and global competence?

III. Procedures

A protocol was submitted to the campus Institutional Review Board and the study was approved as Exempt from Human Research. Participation in the study was voluntary and no incentives were offered. Five participants provided the most comprehensive data that allowed for in depth analysis. The sample size of five falls within the range of the recommended sample size for a phenomenological study (Polkinghorne, 1989).

Participants submitted their data using a self-created four-digit code in order to maintain confidentiality. They represented a diverse range of background experiences. Four of the participants were female and one was male. One participant was an Early Childhood Development and Education undergraduate, one was an Elementary Education undergraduate, one was a Psychology undergraduate who was receiving a minor in Early Childhood, one was in the Interdisciplinary Studies Master's program, and one was in the Early Childhood Track of the Education PhD program. Three of the five participants had previous international travel experience and two of those students had been to Italy on previous trips. One student was fluent in English and Spanish, but none of the students spoke Italian. All five participants had completed at least one prior diversity course or training. The male Interdisciplinary Studies major stood out from the group as having extensive experience of international travel, while the most another participant had was two years of travel experience. He was also the bilingual student.

A. Data Collection

As the transformative learning theory (Mezirow, 1978) requires in-depth reflection, data in the form of reflective questionnaires designed to track participants' learning and experiences over the course of the program were collected three times: prior to the start of the study abroad program while participants were still in the United States, at the mid-point of the study abroad program while participants were in Italy, and after the study abroad program ended and participants returned to the United States. Data were analyzed from participants who completed questionnaires at all three data points.

B. Instrument #1

An eight-item **directed reflective journal** was given to participants at pre-departure, mid-program, and post-arrival. The journal was designed for participants to evaluate how their expectations, feelings, and understanding transformed during the study abroad program. The eight questions were the same at each data collection point, with only a change in verbs to indicate at which point in the program the reflection took place. Data at all three collection points were compared to determine the themes that emerged about the Approach as well as global competence skills that were gained throughout the program.

C. Instrument #2

A ***Profile of the University of Central Florida Globally Competent Student*** (see Appendix A) provided by the campus Office of International Studies (2010) was given at pre-departure and post-arrival. This questionnaire required participants to evaluate their knowledge about the Reggio Emilia region as well as evaluate culture, values, and language from a personal and a diverse perspective. Participants were asked to answer several questions within three main categories: (a) Demonstrate basic knowledge of the places you are to visit/visited; (b) Demonstrate self-awareness and self-reliance; and (c) General outcomes for language programs. An example of a response item under the basic knowledge category was "Describe examples of the local cultures of the countries to be visited/that were visited." An example of a response item under the self-awareness and self-reliance category was "Describe your ability to relate to people from different cultures and backgrounds." Finally, an example of a response item under the outcomes for language programs category was "Describe non-verbal cues for the countries to be visited/that were visited." The campus Office of International Studies designed these specific questions as learning outcomes for a study abroad program and were based on characteristics that were identified to contribute to the global competitiveness of graduates from this institution. Pre-departure and post-arrival questionnaires were compared to determine ways in which global competence skills transformed during the study abroad experience.

D. Instrument #3

A **demographic questionnaire** was given at pre-departure to collect biographic and background information about the study abroad participants, including age, gender, ethnicity, major, number of diversity training and international experiences, and fluency in a second

language. This information was evaluated to determine if patterns emerged in similarities and differences in participants' biographic information that may have impacted the study abroad experience.

IV. Data Analysis

Responses from the pre-, mid-, and post-directed reflective journals and the pre- and post-*Profile of the University of Central Florida Globally Competent Student* (Office of International Studies, 2010) after the conclusion of the project were used to determine the global competence themes that emerged from pre-service teachers in the current study in relation to previous studies. Data in the study presented here were analyzed using a qualitative, phenomenological approach to determine if the emergent themes within participants' lived experiences and the meanings they make of those experiences are consistent with the two overall themes in the previously reviewed research: (a) consideration of diverse teaching practices and (b) cultural adaptability and sensitivity. Additionally, other themes about global competence and pre-professional education that emerged during the study abroad program are examined.

Using the phenomenological method of data analysis (Creswell, 2007), participants' responses were first read several times, significant phrases from responses were then highlighted, which resulted in the formulation of clustered themes present across the responses. Thus, data from the three reflective journals, the two questionnaires, and the demographic information were triangulated, to form common themes that emerged from the pre-departure to post-arrival. Below, quotes from responses on the reflective journals and the questionnaires were used to provide more insight to the lived experiences and meanings the participants' made of the experiences during the study abroad program.

V. Findings

In examining participants' responses, three major transformative themes emerged: (a) an increase in content knowledge of the Reggio Emilia Approach; (b) views of cultural differences; and (c) a heightened self-awareness after reflecting upon experiences and returning to the United States.

A. Transformative Theme 1: Increase in Content Knowledge of the Reggio Emilia Approach

After reflecting on study abroad experiences, the participants felt their content knowledge of the Approach increased and, more specifically, discovered how creative and critical thinking activities can enhance teaching practices. The participants were especially impacted by the Approach's use of creative and critical thinking and its relationship to teaching and learning. The following quotes represent thoughts on this concept:

"The natural touches and creativity brought me to tears." (Code 0124)
"I believe this experience will allow me to explore different ways I can instruct young minds and embrace their creativity and development." (Code 6394)

"[The most rewarding aspect] was witnessing with my own eyes children ages 4-6 creating clay sculptures that could rival—or beat—anything that I could do...If we let kids construct their own knowledge, they will." (Code MOOS)

"I feel as if these [hands-on activities] have not only changed the way I think about teaching children, but they have also stimulated my own brain and have challenged me to become a more creative and critical thinker." (Code 0831)

Similar to the earlier study completed by Brindley et al. (2009), pre-service teachers in the Reggio Emilia study abroad program reflected on teaching practices employed with the Approach and how the practices in relation to "the curriculum, the teacher, the learner, the building, and the community" (p. 528) were similar and different to those in the United States. In general, all participants believed they learned more than they could in a classroom at home, that content knowledge of the Approach increased, and they gained more knowledge of the benefits of the Approach, especially in relation to working with young children. All of the participants also indicated that the experience caused them to view children with more respect and as stakeholders of their own learning, a key aspect of the Approach (Edwards, Gandini, & Forman, 2012) as well as NAEYC's position on developmentally appropriate practices. One participant (Code 0392) was so inspired by the experiences that she changed her major from Elementary Education to Early Childhood Development and Education while she was in Reggio Emilia.

B. Transformative Theme 2: Views of Cultural Differences

Both Williams (2005) and Trilokekar and Kukar (2011) examined participants' interactions with diverse cultures during study abroad. Similarly, participants in the Reggio Emilia study abroad program had difficulties adapting to everyday cultural practices such a shopping for food, navigating the public transportation systems, and communicating with Italians in professional and informal settings. They experienced a sense of being an outsider and felt disliked by some native Italians. In their reflections, the participants indicated how they learned to adapt to the culture by becoming proficient in nonverbal communication and connecting with others in formal settings through the common lens of educating young children. Also similarly to the previous studies, all of the participants gained a more thorough understanding of different cultural norms as well as historical and current events stemming from the Reggio Emilia region of Italy. Participants used specific cultural examples such as: each city has a unique culture, the ways in which men scrutinize women in public, the current economic crisis, drinking coffee, and an increased use in bicycles over cars. One participant summarized Italian culture as seen in Reggio Emilia by stating, "They cherish their victories and losses through statues and educate their students through a community perspective." (Code 0392)

Additionally, reflections indicated that the participants discovered a need for their own future students to become culturally aware as well:

"…After experiencing a new culture, I developed a larger sense of importance and need for more language and cultural programs within the public school system." (Code 0124)

"I learned more about how to be able to relate to people from different cultures and backgrounds after this trip. We can't assume people in other cultures do things the same way we do. Even the simplest things can be done differently." (Code 6394)

The participants in this study also reflected on how this experience was only the start of becoming more culturally aware. One participant in particular reflected in-depth on this idea:

"…I feel as though I was missing out before I had traveled and almost like I was not living to my full potential by engaging with other cultures and always striving to learn new things…This trip touched me in so many ways. I am incredibly fascinated with the fact that there are so many differing cultures out there that I don't know anything about. I am so much more eager to explore and learn from others after this trip. It's such a wonderful feeling! I had never placed such an importance on opening myself up to different cultural experiences and truly pushing myself out of my comfort zone. Now I want to continue to travel and learn about different cultures, religions, and ways of living." (Code 0124)

Therefore, the study abroad program not only transformed participants' knowledge of a different, specific culture, but also increased their desire to travel, learn more about other cultures, and infuse cultural education into their future classrooms, which are consistent themes found by other researchers (Trilokekar & Kukar, 2011; Williams 2005).

C. Transformative Theme 3: Heightened Self-Awareness

Trilokekar and Kukar (2011) found that the participants in their study experienced a sense of culture shock, which can be defined as discomfort when a person encounters experiences that are culturally unfamiliar to them. In the Trilokekar and Kukar study, participants' responses indicated they were uncomfortable when they realized they live in a nation that was more powerful and privileged than the nation in which they were studying. In the current study, a similar pattern emerged in regards to participants' having a more heightened self-awareness. The participants realized that Americans were different and had more privileges, which resulted in negative feelings about Americans and the American school system, which they wrote about when reflecting on their experiences:

"America seems more fast-paced. There are less 'family-owned' restaurants. In the cities I have lived in, we depend less on public transportation or bicycling. We are more stand-offish with each other. In America, I would never see two men greet each other by hugging or kissing on cheeks." (Code 0831)

[Reflecting on American culture before and after study abroad]: "Before I had no idea, but now I realize that we're all about consuming as much as possible (without giving back to the earth) and being lazy, impatient, and selfish." (Code 0392)

"Americans need to be more open minded and cultured." (Code 0124)
"[I have a] fear of not being able to accomplish the Reggio experience in a mainstream US school. [I am convinced that] if I teach in the US I will not be happy. I feel like I need to teach in Reggio if I want to have the professional teaching experience I've always dreamed of having." (Code 0392)

As participants gained appreciation for Italian culture and education, their self-awareness of American culture and education became increasingly more negative.

VI. Conclusions and Discussions

Using transformative learning theory (Mezirow, 1978), participants were required to complete in-depth reflections that indicated how they constructed knowledge and how their world view changed after completing a two week study abroad program to Reggio Emilia, Italy. As indicated above, pre-service teachers' responses suggested three transformative learning themes as a result of their participation in the Study Abroad Program to Reggio Emilia, Italy. These transformative learning themes included: a) an increase in content knowledge of the Reggio Emilia Approach; b) views of cultural differences; and c) a heightened self-awareness after returning to the United States.

Upon reviewing participants' demographic information and comparing them to pre-departure and post-arrival questionnaire responses and pre-departure, mid-program, and post-arrival journal reflections, the male Interdisciplinary Studies major's responses did not indicate much growth in global competence, as defined by NEA (2010) above. He had also indicated more travel experience than the other participants in his demographic questionnaire, which could result in a pre-existing high degree of global competence. The remaining participants, who had comparable backgrounds and limited experiences with travel, had similar responses and growth in global competence. However, all students, irrespective of demographic background, indicated some degree of increased global competence in areas identified in previous research (Brindley et al., 2009; Trilokekar & Kukar; 2011; Williams, 2005), in which transformative themes of consideration of diverse teaching practice, cultural adaptability and sensitivity, and heightened self-awareness emerged. Additionally, participants' responses indicated increased knowledge in two components of NEA's (2010) definition of global competence: international awareness and appreciation of cultural diversity.

The group of students who went to Reggio Emilia struggled most with reactions to differences in culture and the language barrier. They also indicated that the creative and critical thinking activities where children are able to construct their own knowledge were the most eye-opening and beneficial. While it may not be feasible for all pre-service teachers to enroll in a study abroad program, participant responses in this study can offer some indication of activities that can be incorporated into existing education programs to increase global competence. This study and previous research indicated that experiences where pre-service teachers are placed in situations outside the cultural norm, while initially disorienting, can increase cultural adaptability and sensitivity.

Finally, since the end of the study abroad program, participants have been invited to present at the university's early learning center as part of its professional development day. Study abroad participants have also chosen the Approach when completing theory-based assignments in their courses and, subsequently, continue to share their knowledge with their pre-professional colleagues. The transformative learning that occurred during this two week study abroad to Reggio Emilia has not only shaped the ways in which the participants view developmentally appropriate practices and global learning, but their continuous enthusiasm in sharing experiences is starting to benefit others in the local teaching profession, thus enhancing the skills and knowledge of many pre-professionals and professionals who did not have the study abroad experience.

VII. Recommendations for Future Research

Although these qualitative results are not generalizable to large populations, it is hoped that this study will inspire other researchers to carry out similar studies in order to impact their teacher education programs. The relatively small sample of 5 is a recommended size for a phenomenological study, it would be beneficial to increase the number of students who provide comprehensive data about their experiences. In addition to the recommended methods of data collection regarding transformative learning -such as through questionnaires and journals (Mezirow, 1978), semi-structured face-to-face interviews at each data collection point could offer a more thorough insight into participants' experiences. Further, participants in this study experienced a two-week study abroad with four school visits and additional cultural experiences designed to increase their understanding of the Reggio Emilia Approach and this region of Italy. This brief program could not provide as full of an immersion into the culture and the school system as a more extended stay could have. Thus, a longer study abroad program could offer further insights into pre-service teachers' transformative learning and increased global competence during study abroad. Additionally, future programs could benefit from an examination into the similarities and differences between the Approach and Italian Montessori philosophies in order to strengthen pre-service teachers' knowledge of historical theories and practices in Early Childhood Education.

In future studies, it may also be beneficial to compare a group of American students who study in an English-speaking country to a group who study in a non-English-speaking country to determine how much of a factor language is in pre-service teachers' transformative learning and increase in global competence during study abroad. Additionally, a longitudinal study that tracks pre-service teachers who participate in study abroad programs and pre-service teachers who do not participate after they begin teaching could be beneficial to determine how global competence skills are retained or used once they enter the profession. Lastly, pre-service teachers need to conceptualize that, not only are they global citizens, but they must also teach their future students to be globally competent. A study of globally competent characteristics and how they can be meaningfully integrated into the curriculum could benefit future professionals, students, and families as well.

Appendix A. Profile of the University of Central Florida Globally Competent Student

I. <u>After</u> **students participate in a study abroad experience, students should be able to do the following:**
   A. **Compare/contrast your prior knowledge of each the following with that gained during your experience:**
      (1) The main cultural, geographic, physical, politico-economic and social characteristics of the places visited
      (2) Sources of information for the countries visited
      (3) Currencies and currency trends for the places visited
      (4) Examples of the local cultures of the countries visited
      (5) Describe how you applied orientation information within a cultural context
   B. **Compare/contrast your prior self awareness and self-reliance with that after your experience.**
      (1) Description of your own culture before and after

(2) Your personal values before and after

(3) Your ability to deal with the components of international travel (immigration, currency, transportation, housing…) before and after

(4) Your adaptability to be functional in new and unfamiliar circumstances before and after

(5) Your ability to deal with challenging situations before and after

(6) Your ability to relate to people from different cultures and backgrounds before and after

(7) Your ability to identify signs of intercultural conflict before and after

(8) Your ability to integrate experiences into your learning (personal growth) before and after

(9) Your ability to identify signs of trouble and react accordingly before and after

(10) Your ability to develop a personal budget before and after

(11) Your tolerance for complex and ambiguous situations before and after

(12) Your ability to work independently before and after

(13) Your ability to work in culturally diverse teams before and after

(14) Define your level of curiosity about cultural exploration before and after

(15) Your ability to analyze and empathize with the personal situations of others before and after

C. **Compare/contrast your general outcomes for language programs (in addition to the language specific ones) prior to the experience abroad with those after the experience.**

(1) Recognize appropriate use of language in different cultural contexts (formal, etc.) before and after

(2) Describe non-verbal cues for the countries to be visited before and after

(3) Recognize and describe cultural norms for the country before and after

References

Brindley, R., Quinn, S., & Morton, M. L. (2009). Consonance and dissonance in a study abroad program as a catalyst for professional development of pre-service teachers. *Teaching & Teacher Education, 25*(3), 525-532. doi: 10.1016/j.tate.2008.09.012

Creswell, J. W. (2007). *Qualitative inquiry & research design: Choosing among five approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Edwards, C., Gandini, L., & Forman, G. (Eds.). (2012). *The hundred languages of children: The Reggio Emilia experience in transformation* (3rd ed.). Santa Barbara, CA: Praeger.

Essa, E.L. (2007). *Introduction to early childhood education* (5th ed.). Clifton Park, NY: Thomson Delmar Learning.

Gall, M.D., Gall, J.P., & Borg, W.R. (2007). *Educational research: An introduction* (8th ed.). Boston, MA: Allyn and Bacon.

Hays, D.G., & Wood, C. (2011). Infusing qualitative traditions in counseling research designs. *Journal of Counseling Development*, *89*, 288-295.

Hovland, K. (2009). Global learning: What is it? Who is responsible for it? *Peer Review, 11*(4), 4-7. Retrieved from http://ezproxy.lib.ucf.edu/login?URL=http://search.ebscohost.com.ezproxy.lib.ucf.edu/login.aspx?direct=true&db=aph&AN=45615490&site=ehost-live

Lucas, T., & Villegas, A. M. (2002). Preparing culturally responsive teachers: Rethinking the curriculum. *Journal of Teacher Education, 53*(1), 20-32. Retrieved from http://go.galegroup.com.ezproxy.lib.ucf.edu/ps/i.do?id=GALE%7CA82005174&v=2.1&u=orla57816&it=r&p=AONE&sw=w

Malaguzzi, L. (1993). For an education based on relationships. *Young Children, 49*(1), 9-12. Retrieved from http://www.reggioalliance.org/downloads/malaguzziyoungchildren.pdf

Mansilla, V. B., & Jackson, A. (2011). *Educating for global competence: Preparing our youth to engage the world.* Retrieved from http://asiasociety.org/files/book-globalcompetence.pdf

Mezirow, J. (1978). Perspective transformation. *Adult Education, 28*, 100-110. doi: 10.1177/074171367802800202

Mezirow, J. (1996). Contemporary paradigms of learning. *Adult Education Quarterly, 46*(3), 158-173. doi: 10.1177/074171369604600303

Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education*, *74*, 5-12. doi: 10.1002/ace.7401

National Association for the Education of Young Children. (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8.* Retrieved from http://www.naeyc.org/files/naeyc/file/positions/PSDAP.pdf

National Education Association. (2010). *Global competence is a 21st century imperative.* Retrieved from http://www.nea.org/assets/docs/HE/PB28A_Global_Competence11.pdf

Office of International Studies. (2010, July). *Profile of the XXXX globally competent student*. (Handout). XXXX.

Polkinghorne, D. E. (1989). Phenomenological research methods. In R. S. Valle & S. Halling (Eds.), *Existential-phenomenological perspectives in psychology* (pp. 41-60). New York: Plenum Press.

Reggio Lingua. (n.d.). *The school*. Retrieved from http://www.reggiolingua.it/en/index.php?id=1

Vatalaro, A., Szente, J., & Levin, J.

Taylor, E. W. (2008). Transformative learning theory. *New Directions for Adult and Continuing Education,* 119, 5-15. doi: 10.1002/ace.301

Trilokekar, R. D., & Kukar, P. (2011). Disorienting experiences during study abroad: Reflections of pre-service teacher candidates. *Teaching & Teacher Education, 27*(7), 1141-1150. doi: 10.1016/j.tate.2011.06.002

Trilokekar, R. D., & Rasmi, S. (2011). Student perceptions of international education and study abroad: A pilot study at York University, Canada. *Intercultural Education, 22*(6), 495-511. doi: 10.1080/14675986.2011.644951

Tucker, J. L. (1982). Developing a global dimension in teacher education: The Florida International University Experience. *Theory into Practice, 21*(3, Global Education), 212-217. Retrieved from http://www.jstor.org/stable/1476769

Wells, R. (2008). The global and the multicultural: Opportunities, challenges, and suggestions for teacher education. *Multicultural Perspectives, 10*(3), 142-149. doi: 10.1080/15210960802197656

Williams, T.R. (2005). Exploring the impact of study abroad on students' intercultural communication skills: Adaptability and sensitivity. *Journal of Studies in International Education, 9*(4), 356-371. Retrieved from http://ezproxy.lib.ucf.edu/login?URL=http://search.ebscohost.com.ezproxy.lib.ucf.edu/login.aspx?direct=true&db=aph&AN=20158273&site=ehost-live

International teaching assistants' experiences in the U.S. classrooms: Implications for practice

Ekaterina Ashavskaya[1]

Abstract: Recently, a number of studies have examined the lived experiences of the international teaching assistants (ITAs) in the U.S. classrooms. The findings show that the ITAs face many challenges such as classroom management, instructional, linguistic, cultural, and social challenges. Following this line of research, this interview-based study examined the lived experiences of a group of ITAs using qualitative methodology. The paper aims to: (1) to provide insights into the ITAs' perspectives on their first semester of teaching in the U.S. including determining the challenges they face and (2) to consider possible revisions to existing ITAs' preparation programs based on the ITAs' own perspectives and a review of the available literature. This study contributes to the field by presenting information that has the potential to prompt future empirical investigations into educational cultures as they apply to novice instructors in international contexts and to inform and renew curricula for ITAs' preparation programs at the U.S. universities.

Keywords: international teaching assistants (ITAs), qualitative approach, educational cultures, international contexts, sciences

"Unfortunately, I have those students who don't know what they are doing because they don't even know the basics of chemistry …" (Irina, an ITA from Russia)

"A student came to see me and asked about why I deducted some points … and then things got out of hand … He was being rude … He used the words like "You are full of crap." … I was maintaining my composure, but he lost his cool. So, managing and adjusting to every student is important. How the students will behave and how you will react. Because if somebody says: "You are full of crap," there are various thoughts running in your mind…" (Michael, an ITA from China)

The comments above, one from an international teaching assistant (ITA) in chemistry from Russia and the other from an ITA in computer science from China, indicate the kinds of challenges that ITAs face on a daily basis in the U.S. classrooms. Even though many of the challenges are encountered by beginning instructors independent of their national origin, ITAs face the additional task of adopting the skills of cross-cultural competency in order to successfully communicate with U.S. undergraduate students (Smith, Meyers, & Burkhalter, 1992). A recent review of existing research shows that ITAs as new instructors in an unfamiliar instructional context encounter specific instructional, cultural, and linguistic challenges (Zhou, 2009). This study aims to contribute to the existing body of literature related to ITAs' development of professional expertise (e.g., Aubrey, 1991; Gorsuch, 2012; Lin & Yi, 1997;

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[1] Assistant Professor, Utah State University, ekaterina.a@usu.edu

LoCastro & Tapper, 2006; Stevenson & Jenkins, 1994; Trebing, 2007) by exploring the ITAs' own perspectives on the nature of their experiences in the U.S. classrooms, the kinds of challenges they face as instructors in an unfamiliar instructional context, and their perspectives on how the ITAs' preparation programs and respective departments can better support them. This study thus draws attention to the ITAs as important members of the U.S. academic communities and raises awareness of their unique contributions to the system of the U.S. education.

That said, the purpose of this paper is twofold: (1) to provide insights into the ITAs' perspectives on their first semester of teaching in the U.S. including determining the challenges they face and (2) to consider possible revisions to existing ITAs' preparation programs based on the ITAs' perspectives and a review of the available literature. This study will contribute to the field by presenting information that has the potential to stimulate future empirical research into educational cultures as they apply to new teachers in international contexts and to inform and renew curricula for ITAs' preparation programs at the U.S. universities. The study will pursue the following research questions:

1. What are the challenges faced by the ITAs in the U.S. classrooms?
2. How does the U.S. educational culture compare to the ITAs' home countries' educational cultures?
3. How, from the ITAs' perspective, can the ITAs' preparation programs better prepare and support incoming ITAs?

I. Theoretical Framework

Novice teacher learning (including ITAs) can be conceptualized through the prism of the situated learning theory grounded in social constructivist perspectives on learning (Lave & Wenger, 1991; Rogoff, 1984). According to this perspective, a more experienced teacher is conceptualized as an expert, whereas the novice teacher is conceptualized as an apprentice who learns to teach through participating in activities related to teaching and whose participation patterns change from peripheral to full (Wang & Odell, 2007).

Within this theoretical framework, learning is viewed as participation in the social activities of a given community (Lave & Wenger, 1991). Situated learning involves learning ways of doing certain things in certain contexts and appropriating the discourse and values of a given community (Lave & Wenger, 1991). At the same time, gaining legitimacy in a given community of practice is not necessarily easy. For example, Warhurst (2008) showed how in a research-oriented UK university new lecturers were oftentimes provided with an insignificant amount of feedback on their teaching due to the fact that their mentors were focused on the research element of their academic work. Limited feedback and lack of mentoring made the newcomers feel isolated, and these factors inhibited their professional growth.

Lave and Wenger (1991) also propose that situated learning involves a process of identity re-construction on the part of learners. In Maynard's (2001) study, during a school-based teaching practicum student-teachers felt that they needed to fit in; i.e., they imitated the mentors' practices in an effort to get the children to respond to them. At the same time, the student-teachers did not want to give up their own idealistic notions about teaching or being themselves in the classroom. In other words, they wanted the children and the mentors to see them as competent educators, but they also "wanted their own personalities to come out" (p. 45). The novices tended to see these two outcomes as mutually exclusive or at least in tension with each other. Thus, many of the student-teachers experienced an inner conflict on this basis. In regard to

the identity development of novice teachers, it is necessary for each novice teacher to develop an identity that is "personally satisfying as well as institutionally fitting and productive" (Bullough & Knowles, 1991, p. 123).

Overall, then, the situated learning model of teacher learning reflects many of the aspects of the process of becoming a teacher and, therefore, can be applied to our understanding of ITAs' experiences during their first semester of teaching in the U.S.

II. ITAs' Experiences in the Literature

Recently, a number of studies have examined the lived experiences of the ITAs in the U.S. classrooms. The results of these investigations show that the ITAs face many challenges such as classroom management, instructional, linguistic, cultural and social challenges (Bresnahan & Cai, 2000; Kuo, 2002, 2011). In relation to the classroom management issues, the ITAs admit that the lack of information about the U.S. grading and testing system makes them feel anxious and frustrated (Lin & Yi, 1997). In addition, many ITAs complain about the U.S. undergraduate students' use of bad language, early departures and late arrivals, and eating and drinking during the class (Bresnahan & Cai, 2000). And even though issues related to classroom discipline are common for novice teachers regardless of their country of origin, the ITAs, particularly those who were educated in Asian countries, are used to more compliant students' behaviors (Bresnahan & Cai, 2000) and, therefore, may have to put in more efforts to cope with such misbehaviors. In regard to the linguistic challenges, international graduate students reported on difficulties associated with the necessity to actively orally participate in class discussions since in their home countries they were expected to merely listen to their professors rather than be more actively involved (Aubrey, 1991; Kuo, 2011). Along with linguistic challenges, many ITAs (in particular, the ITAs of Asian backgrounds) reported on the instructional challenges they face in the classrooms such as feeling frustrated over having to change their teaching style (Torkelson, 1992) and having to deal with students who interrupt them to ask questions during the class (Kuo, 2002). In relation to the cultural challenges, the ITAs admitted feeling uncomfortable when called by first name and having to call their professors by first names (Bresnahan & Cai, 2000). In addition, many ITAs found it difficult to adapt to the more informal relationship common between the U.S. students and their professors (Kuo, 2002). Finally, in regard to the social challenges, the ITAs reported on having a hard time making friends with Americans. In some cases, the ITAs prioritized their obligations to their home communities and, therefore, had less time to afford to developing relationships with the U.S. students (Smith, 1993). In order to address the social and cultural challenges, a Buddy program for ITAs has been successfully implemented at Michigan State University (Altinsel & Rittenberg, 1998; Kuo, 2002). Within this program, an ITA is paired with a U.S. undergraduate student for an entire academic semester, allowing both groups of students to learn more about each other's academic and social experiences.

Overall, while a number of studies have addressed the challenges and issues the ITAs encounter in their daily experiences while teaching in the U.S., fewer researchers have proposed ways to address these challenges (Altinsel & Rittenberg, 1998; Kuo, 2002). Following this line of research, this in-depth, interview-based study, centered in the sciences at a U.S. higher education institution, explores the lived experiences of a group of ITAs using qualitative methodology and suggests possible revisions to the existing ITAs' preparation programs. It focuses on the ITAs from several distinct educational and cultural backgrounds, thus

highlighting the diverse nature of the teaching experiences of the ITAs during their first semester of teaching at a U.S. university.

III. The Study

A. Methodology

Grounded in the qualitative methodology approach (Strauss & Corbin, 1998), this study is based on three semi-structured interviews with each of the participating ITAs. The goal of qualitative research is to "understand the nature or the meaning of the experience" of the ITAs (Strauss & Corbin, 1998, p. 11) and "to offer insight, enhance understanding, and provide a meaningful guide for action" (Strauss & Corbin, 1998, p. 12).

Responding to the urge to accommodate the needs of a growing number of incoming ITAs at U.S. universities, this study involved a detailed content analysis of the interviews of the participating ITAs at a southwestern U.S. university. The transcripts of the three interviews were read and re-read repeatedly by the researcher throughout and upon the completion of the data collection period. Each interview was divided into topics, coded, and sorted into themes. In repeated reviews of the data, themes were scrutinized and either collapsed or created, as further investigation suggested (Glaser & Strauss, 1967). A series of subsequent email exchanges with the participating ITAs served as a member check (Lincoln & Guba, 1985; Maxwell, 2004) and was integrated into the data analysis below. Therefore, the data analysis reflects the collaborative and co-constructed interpretation of the interviews with the participants, which strengthens the validity of the final analysis.

B. Participants

Table 1 presents the six participants in the study (see section Limitations of the study addressing the number of the participants). In order to preserve confidentiality of the findings, all the participants were given pseudonyms. The ITAs in computer science were three male (two from India and one from China) and one female (from India) graduate students. In chemistry, there were a female student from Russia and a male student from Nepal.

Table 1

Participants

Background Information
Michael is a male Master of Science (Computer Science) student from China.
Madhav is a male Master of Science (Computer Science) student from India.
Pia is a female Master of Science (Computer Science) student from India.
Vickey is a male Doctoral (Computer Science) student from India.
Irina is a female Doctoral (Chemistry) student from Russia.
Saleh is a male Doctoral (Chemistry) student from Nepal.

The ITAs were recruited during the ITAs' training workshops offered at a southwestern U.S. university in the summer and fall semesters of 2013. During the period of the data

collection, all the participants were in their first semester of teaching in the U.S. Their teaching responsibilities included grading students' work, leading laboratory sessions, supervising student group work during class meetings, and holding office hours.

C. Instructional Context

The ITAs' training workshops are offered twice throughout the academic year (the summer and fall semesters). During the workshops, the ITAs discuss topics related to the U.S. educational culture, the characteristics of interactive teaching, the discourse of teaching, and the issues relating to office hours. In addition, the ITAs participate in daily practicum experiences. For example, they are required to present a concept or term from their respective field of study or explain a problem and its solution, applying the principles of interactive teaching discussed as part of the ITAs' preparation workshop.

D. Data Collection

The data were collected during the ITAs' training workshops offered at a southwestern U.S. university. The ITAs were interviewed about their teaching experience in the U.S. at the beginning, middle, and end of their first semester of teaching in this context. The interview questions are provided in Appendix A.

E. Results

Research question 1: What are the challenges faced by the ITAs in the U.S. classrooms? In this study, similarly to the earlier research (e.g., Bresnahan & Cai, 2000; Kuo, 2002, 2011), the ITAs identified the following challenges: classroom management, linguistic, instructional, and cultural challenges. The bold text in each data set demonstrates the linguistic instantiations of the ITAs' perceptions and understandings with regards to the various challenges.

Classroom management challenges. In regard to the classroom management issues, the ITAs shared that many U.S. undergraduate students do not review the course syllabus prior to the class meetings and, therefore, are not prepared for a particular class activities. In addition, two of the ITAs said that some of the students do not clean their desks and equipment after a laboratory session, do not pay attention during the class, and do not take notes from the board. In Irina's own words:

> You should not expect them to be adults. You should treat them like kids. **They will not clean up after the lab, unless you tell them. They will not look at the syllabus what lab section they will have.** You should tell them everything. (Interview 3)

In addition, one ITA reported on one of his student's use of bad language and being disrespectful during an office hours' meeting. Michael, an ITA from China, recalled:

> A student came to see me and ask about why I deducted some points and then things got out of hand. **He was being rude. He used the words like "You are full of crap." I was maintaining my composure, but he lost his cool.** So, managing and adjusting to every student is important. How the students will behave and how you will react. **Because if somebody says: "You are full of crap," there are various thoughts running in your mind. . . .** (Interview 2)

When probed by the researcher as to how the ITAs attend to the inattentive students, two of the ITAs shared that they call their students by name to attract their attention. In addition, one of the ITAs (Irina) stated that she provided the weaker students with correct answers to the items on the quizzes that they did not complete. Furthermore, she admitted that she was lenient in grading the students' assignments. As for dealing with students' use of bad language, Michael commented that maintaining his composure was crucial in this situation.

Overall, while experiencing certain classroom management challenges, the ITAs were at the same time developing strategies to deal with the issues they encountered. Yet, some of their instructional decisions seem arguable (e.g., being lenient in grading) and, therefore, developing and implementing the mechanisms of ongoing support and assistance (e.g., mentoring by more expert peers or professors) from the ITAs' respective departments is necessary. Additionally, interestingly, despite being provided with the information about possible students' use of bad language during the ITAs' preparation program, one of the ITAs still found this difficult to go through, particularly due to the potential racist basis of the student's remarks.

Linguistic challenges. In regard to the linguistic challenges, all of the ITAs admitted that undergraduate students speak fast, use short sentences and informal language, which many international students may not know. For example, Saleh, an ITA from Nepal, offered this account:

> I think language. **Students use more informal language, like slang. Like "fishy." It's something unclear or unconvincing. So ITAs may not know them . . .** and they don't like to talk in long sentences like international students. **They prefer short sentences.** (Interview 3)

In addition, one of the ITAs admitted that discipline-specific concepts were hard to explain and that she felt the need to increase her fluency and expand discipline-related vocabulary. Two other ITAs reported on miscommunication problems due to accent.

When queried by the researcher as to how the ITAs deal with the linguistic challenges they encounter, two of the ITAs explained that as the semester progressed they were able to better communicate and understand American English. Besides that, another participant stated that chatting with his students informally before and after his class helped him learn a number of informal expressions.

Overall, developing one's language ability is not an easy endeavor and it takes a long time. Furthermore, it requires an ITA to be patient, willing to try and learn from, for example, his or her students.

Instructional challenges. In relation to the instructional challenges, all of the participants pointed to their lack of knowledge in regard to the academic level of the students. Two of the participants noted that the students were not always ready to learn because they had not received sufficient relevant education at an earlier point in their schooling. For instance, Irina, an ITA from Russia, commented that "Unfortunately, I have those students who don't know what they are doing because **they don't even know the basics of chemistry**." (Interview 2) The issue related to the need to know more about the academic preparedness of the students was further exacerbated by the fact that the U.S. students were less academically prepared than the same-level students in the ITAs' home countries. For example, Saleh, an ITA from Nepal, expressed his reaction:

> I teach labs and most of the students are not chemistry majors. Sometimes they may not understand a chemical term. And sometimes they are not familiar with equipment . . . **and undergraduate students have less knowledge as compared to my country . . .**

they don't even have some basic knowledge of chemistry and some of them are not so attentive. (Interview 1)

Further, two of the ITAs reported that they had experienced difficulty in terms of matching the level of knowledge of their instructors. As part of their teaching responsibilities, the ITAs were required to supervise group work in their instructor's classroom. While the instructor worked with other groups, the ITAs were required to supervise the work of several remaining groups of students. The ITAs were concerned that they lacked the ability to provide the students with a level of instruction comparable to that provided by the course instructors. Finally, one of the ITAs was concerned about developing additional techniques for teaching in the lab as it is difficult to be interactive in this environment. Even though he was consciously aware of the need to apply a more interactive style of teaching in his classroom, he was not always ready to actively apply this knowledge in a classroom setting.

In regard to the strategies the ITAs utilized in order to address the instructional issues described above, the ITAs admitted that as the semester progressed, they had developed a better understanding of the level of their students' academic preparedness. Furthermore, they expected to do a better job when re-teaching the same course in cooperation with their professor or on their own (depending on their instructional responsibilities) during their second semester. At the same time, one ITA was still unsure as to how he could create a more interactive classroom environment for his students in the lab settings. Such statements reflect the idea that becoming a successful ITA takes time and perseverance. In addition, the findings shows that an ITA can be passively aware of the expectations the U.S. students hold for the teaching approach, but may need a longer period of time to implement new ideas.

Cultural challenges. Finally, in regard to the cultural challenges, one of the ITAs related a story having to do with the negative attitudes towards international instructors exhibited by the U.S. undergraduate students. In Irina's own words:

I heard this story from my husband. A student came to his first class and said, "**Oh, I am so glad I got an American TA**" but then he turned to her and said that he was actually an international instructor **and then she never came back to his other classes**. He doesn't know why for sure but that may be the reason. (Interview 3)

In addition, another ITA admitted his having to adapt to the different rules with regards to the physical contact between teachers and students. In Saleh's own words, "**In our country, you can touch students. Here, you can't do this**." (Interview 1)

Interestingly, three other participants stated the necessity to "blend in" with the U.S. students, while maintaining their own cultural identity (Indian) by celebrating national holidays, attending family's and relative's gatherings, and preparing ethnic foods.

Despite the fact that the ITAs encountered certain cultural challenges associated with the U.S. students' negative perceptions of the ITAs and having to learn the different rules in relation to physical contact between students and teachers, they expressed a willingness to adapt to the U.S. cultural norms, while maintaining their own cultural identities.

Research question 2: How does the U.S. educational culture compare to the ITAs' home countries' cultures? All the participating ITAs noticed that the U.S. classroom culture was less formal when compared to the classroom culture in their home countries. For example, the students were referred to by their first names, could eat in the classroom, arrive late, and wear jeans and other informal attire. In addition, all the participants admitted that even though at first they felt less comfortable with regard to the differences described above, as the semester

progressed they were able to gradually adapt to the U.S. culture. In part, this may be due to the participants' prior relative familiarity with the U.S. culture. For example, two of the participants reported that they had visited the U.S. before on a tourist visa and four others reported that they had a level of familiarity with the U.S. culture gained from the mass media and interactions with friends and relatives already residing in the U.S.

In addition, all the participants reported that technology is used more extensively in classrooms in the U.S. than in their home countries. For example, Irina noted the following:

> I have a good impression of the U.S. classrooms. They are very organized. And there's a lot of equipment available for undergraduate students. **Even undergraduate students will use the equipment that we didn't have in my home country.** (Interview 1)

Along with the overall greater use of technology in the classroom, two of the participants commented on how the availability of technology impacted the instruction provided to the students. For instance, Saleh, an ITA from Nepal, shared the following account:

> **It's really easier to teach here** because professors can take notes, guides, books. **But in my home country professors are not allowed to bring laptops or anything in the class.** Professor needs to remember everything and present in a systematic way. Otherwise, the students will have a negative conception of this professor. (Interview 2)

However, at the same time, one of the participants expressed some concern about the use of PowerPoint presentations in the classroom: "Here, professors use a lot of presentations, **but I am not sure this is a good approach because it's easier to follow explanations from the board and the slides can contain too much information.**" (Irina, an ITA from Russia) In addition, all of the ITAs pointed to the better facilities, such as the library and computer laboratories, available to both students and professors on the U.S. campuses.

Finally, all the participants noted that they considered faculty members in the U.S. to be more friendly and approachable than those in their respective home countries. Additionally, the ITAs pointed to the more interactive approach to teaching characterizing the U.S. professors' classroom style. For example, according to one ITA:

> **The professors here are closer to students. They use more interaction with students in the classroom.** It's not only comprehension checks. Here, students have to respond. In my home country, students could sleep in class. (Irina, an ITA from Russia)

In addition, one of the students admitted that the professor he worked with served as a good role-model for him, especially in terms of responding to students' questions:

> **My professor doesn't usually say: "No, this is incorrect", but he says: "This may be true, but I am not sure."** And for the exam he brought some food and drinks. **So, he is caring. And I can learn from him**. (Saleh, an ITA from Nepal)

Overall, besides a more extensive use of technology in the classroom and a more relaxed classroom atmosphere, the ITAs noted that compared to the faculty in their home countries the U.S. faculty members were friendlier and more accessible and pursued a more interactive approach to teaching.

Research question 3: How, from the ITAs' perspective, can the ITA preparation programs better prepare and support incoming ITAs? All the participating ITAs commented that they would be interested in learning more about the differences between the classroom culture of the U.S. and

that of their home countries. Four of the participants also suggested inviting professors from their respective fields of study to give demonstration lessons during the ITA training workshop. In addition, one of the ITAs was interested in learning more about the phonetics of English in order to improve his pronunciation. At the same time, another ITA was concerned about learning additional techniques for teaching in the lab as it is difficult to be interactive in this environment. Finally, one of the ITAs recommended bringing "real" students to the ITA workshops in order to play the office hour role-plays, for example, one playing a really aggressive student or another asking "silly" questions.

F. Limitations of the Study

Clearly, major generalizations about ITAs cannot be made from this research due to the limited sample (six participants). In addition, only four countries are represented: India, China, Russia, and Nepal. Furthermore, the participants were studying in two areas, computer science and chemistry. In the future, a larger and more diverse sample and a longitudinal study that includes, for example, classroom observations of the ITAs' teaching might be a worthwhile research endeavor.

In addition, while the study proposes certain modifications (see Figure 1) to the existing ITAs' preparation programs based on the participants' perspectives and a review of relevant research, solicitation of feedback from the ITAs and ITAs' preparation programs' faculty on these changes seems a worthwhile research endeavor in the future. Also, while many of the issues that the ITAs encountered (e.g., identity formation) are reflected in the situated learning theory (Lave & Wenger, 1991), some others (i.e., cultural, linguistic) are not.

IV. Discussion and Implications

Overall, the ITAs in this study valued the opportunity to teach in a new instructional context and learn from the experience. Yet, in accord with the findings of other research (Bresnahan & Cai, 2000; Kuo, 2002, 2011), they experienced classroom management, instructional, linguistic and cultural challenges. Consequently, ITA preparation programs and respective departments clearly need to do more in order to support the international instructors.

First, some of the participating ITAs mentioned lack of knowledge with regard to the differences between the U.S. general and educational culture and their home countries' culture. From the situated learning theory perspective, we can expect the participating ITAs to develop the necessary cross-cultural skills through participation in the actual activities and contexts of teaching. At the same time, additional support from the ITAs' preparation programs can help facilitate this process. For example, ITAs can be provided with opportunities to experience teaching "real" content to "real" students during the ITAs' preparation course. Such early hands-on experience can provide the ITAs with initial insights into what they might expect once they start their work as ITAs. As for the undergraduate students, some U.S. universities involve U.S. undergraduate students in an intercultural training course (Ross, 2007; Trebing, 2007), which helps this group of students to be more open to other cultures and less ethnocentric. Increased contact between the representatives of distinct groups (e.g., the ITAs and undergraduate students) does not by itself help resolve misunderstandings or break barriers due to, for instance, the power variables. Therefore, educating each group about the characteristics of the other represents a viable instructional strategy.

Secondly, some of the ITAs reported on the difficulties associated with language use. In regard to the linguistic challenges, some ITA preparation programs endorse a component on English as a global language, which increases the overall tolerance for world Englishes and helps to shift away from the deficit construction of the ITAs (LoCastro & Tapper, 2006). Furthermore, LoCastro and Tapper (2006) argue that less attention should be paid to pronunciation training and more to teacher training, which, however, may contradict the ITAs' own perceptions of their needs. Linguistic challenges are closely related to the problem of cultural adaptation. While the students in this study were interested in developing bi-cultural identities, they were at the same time cultural "outsiders" in the teaching as well as the broader U.S. cultural contexts. The students' development and negotiation of comfortable identities both inside and outside the classroom is a process, which, according to the situated learning theory (Lave & Wenger, 1991), emerges "in the contradictions and struggles inherent in social practice and the formation of identities" (p. 57). Perhaps, introducing the ITAs to the ideas related to global Englishes can help them develop more comfortable bi-cultural identities and gain greater confidence in regard to their linguistic proficiency.

Third, the participating ITAs, similarly to all novice instructors, encountered difficulties with maintaining classroom discipline. From the perspective of situated learning, the ITAs need to adopt the practices, values and beliefs of the given community of educators, which can be promoted through greater engagement of the more expert members of this community of practice in their learning. Therefore, in relation to the instructional and classroom management challenges that the ITAs encounter, there seems to be a need in greater involvement and collaboration of the respective ITAs' departments and the ITA preparation programs. This idea was explicitly suggested by four of the participating ITAs. For example, professors from the ITAs' respective fields of study can be invited to give demonstration lessons during the ITA training workshop. In addition, ongoing instructional support and meetings with other TAs and mentors are necessary for the ITAs' successful adaptation to the U.S. educational system due to, for example, debatable decisions of the ITAs in relation to grading student work.

Figure 1 summarizes the proposed changes for revising the existing ITAs' preparation programs, as viewed from the perspective of the participating ITAs and a review of relevant research. Figure 1 describes the changes in three domains: (1) community, (2) instructional contexts, and (3) ITAs.
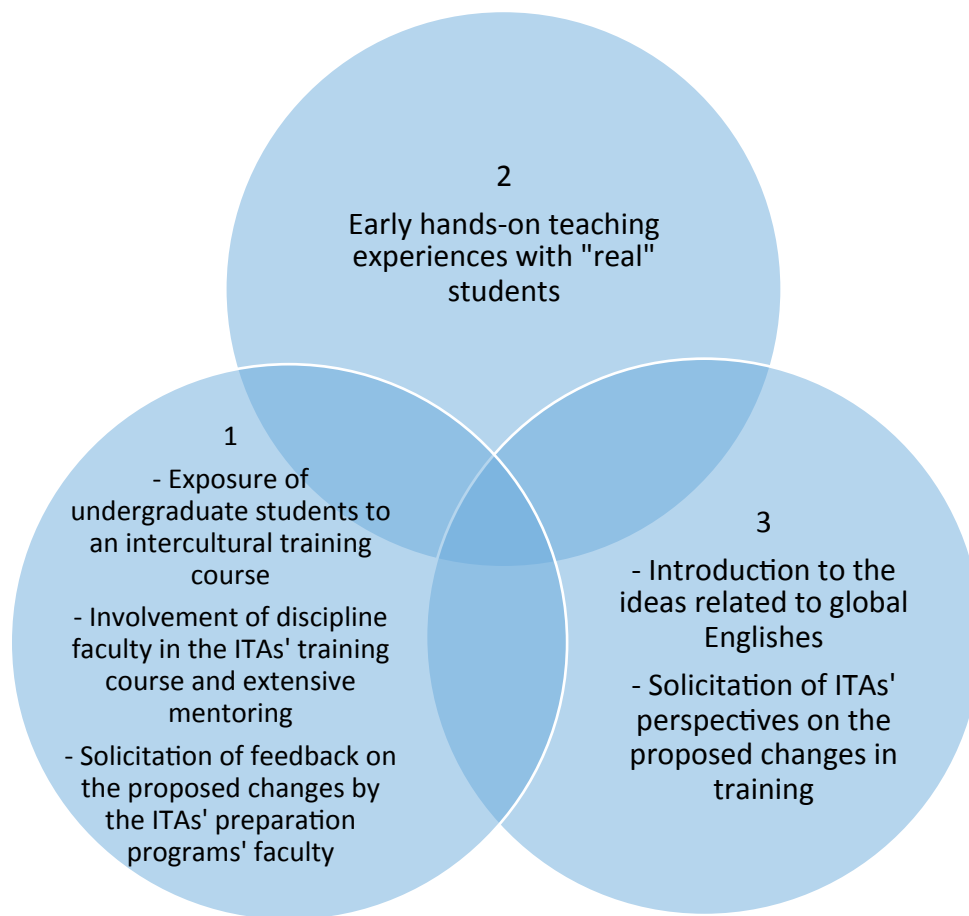
Figure 1. Proposed changes for the existing ITAs' preparation programs.

Despite a limited sample of participants, this article contributes to the data-driven accounts of the ITAs' experiences in the U.S. classrooms and calls for further longitudinal ethnographic studies of ITAs. Such research is needed to help renew and revise the ITAs' preparation programs at the U.S. universities. In addition, this study raises readers' awareness of the importance of ITAs as critical members of U.S. academic communities and urges the ITAs' preparation programs and respective departments to provide greater ongoing support to this group of international educators and search and implement additional measures to assist the ITAs.

Appendix. Interview Questions (adopted from Trebing, 2007)

Personal Information
1.   Name: _____
2.   Nationality: _____
3.   Native language(s):_____
4.   Knowledge of other languages: _____
5.   Major: _____ Degree sought: MA PhD

6.   Gender: Female   Male

Departmental Information:

7.   Please specify the department you have worked for/are working for: _____

a.   Which courses have you taught?

b.   What are/were your specific responsibilities?

c.   How long have you been teaching?

Previous Teaching Experience:

8.   Did you have teaching experience before coming to the U.S.? If so, please describe.

a.   Where did you teach (country, institution)?

b.   How long did you teach (time, semesters)?

c.   Please describe your students (gender, background).

Proficiency in English:

9.   How do you feel about communicating in English?

10.   How do you feel about your proficiency in English?

Teaching Experience:

11.   What was your first impression of a U.S. college classroom?

12.   What are the differences and/or similarities between teaching in the US and in your home country/the place you grew up?

13.   What do you enjoy most about working with (teaching) the U.S. students?

14.   Have you faced any difficulties or challenging situations in the classroom?

a.   If yes, what kinds of difficulties or challenging situations have you faced?

b.   If yes, did you solve these difficulties alone or did you seek help? From whom?

15.   Why do you think these problems and challenging situations occurred?

16.   What do you expect from your U.S. undergraduate students?

17.   How do you prepare for your teaching? Do you have enough time?

18.   How do you teach in the classroom? Specifically:

a.   What specific teaching behaviors or techniques do you use in the classroom?

b.   How do you approach teaching?

c.   How do students address you in your classroom? (first name, last name, etc.)

19.   What are some aspects of your teaching that you especially like? What are some aspects of your teaching that need further development?

20.   If you are teaching this course again next semester, are you planning to make any changes to your teaching approach? If so, what changes will you make? If not, why not?

21.   If you were teaching the same course in your native language, would it be different? How?

22.   What are the characteristics of a proficient TA?

Other Relevant Information:

23.   What are your personal goals for teaching in the U.S.?

24.   Do you have any advice for new ITAs coming to the U.S. from your country?

25.   How did your department help you to prepare for teaching in the U.S.?

26.   Are there things that your department could have done to help you teach more effectively? What are they?

27.   Did you learn anything during your teaching experience this semester that you wish you had known before you started teaching in the U.S.?

28.   Do the U.S. students approach international instructors differently from how they approach the U.S. instructors?

29.   How are ITAs perceived by the U.S. undergraduate students on campus?
30.   Is there anything else that you think is important for new (or returning) ITAs?

References

Altinsel, Z., & Rittenberg, W. (1996). *Cultural support for international TAs: An undergraduate buddy program*. ERIC Document Reproduction Service No. ED 407918.

Aubrey, R. (1991). International students on campus: A challenge for counselors, medical providers, and clinicians. *Smith College Studies in Social Work, 62,* 20-33. doi: 10.1080/00377319109516697

Bresnahan, M. J., & Cai, D. H. (2000). From the other side of the desk: Conversations with international students about teaching in the US. *Qualitative Research Reports in Communication, 4*(1), 65-75.

Bullough, R.V., & Knowles, J.G. (1991). Teaching and nurturing: Changing conceptions of self as teacher. *Qualitative Studies in Education, 4,* 121-140. doi: 10.1080/0951839910040203

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New York, NY: Aldine Publishing Company.

Gorsuch, G.J. (2012). *Working theories for teaching assistant development: Time-tested & robust theories, frameworks, & models for TA & ITA learning.* Stillwater, OK: New Forums Press.

Kuo, Y-H. (2002). International teaching assistants on American campuses. *International Journal of Curriculum and Instruction, 4*(1), 63-71.

Kuo, Y-H. (2011). Language challenges faced by international graduate students in the United States. *Journal of International Students, 1*(2), 38-42.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge, UK: Cambridge University Press. doi: 10.1017/CBO9780511815355

Lin, J.-C. G., & Yi, J. K. (1997). Asian international students' adjustment: Issues and program suggestions. *College Student Journal, 31*(4), 473-480.

Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic inquiry*. Beverly Hills: SAGE.

LoCastro, V., & Tapper, G. (2006). International Teaching Assistants and teacher identity. *Journal of Applied Linguistics, 3*(2), 185-218.

Maxwell, A. J. (2004). *Qualitative research design: An interactive approach* (2nd ed.).Thousand Oaks, CA; Sage.

Maynard, T. (2001). The student-teacher and the school community of practice: A consideration of "learning as participation." *Cambridge Journal of Education, 31*(1), 39-52. doi: 10.1080/03057640123915

Rogoff, B. (1984). Introduction: Thinking and learning in social content. In B. Rogoff and J. Lave (Eds.), *Everyday cognition: Its development in social context*, (pp. 1-8). Cambridge: Harvard University Press.

Ross, C. (2007, March 22). Paper presented as part of the InterSection on *Intercultural communication/international teaching assistants: Redirecting the flow of university intercultural responsibility* at the 41st Annual Teaching English to Speakers of Other Languages Convention in Seattle, WA.

Smith, J., Meyers, C., & Burkhalter, A. (1992). *Communicate: Strategies for International Teaching Assistants.* Long Grove, IL: Waveland Press.

Smith, K.S. (1993). A case study on the successful development of an International Teaching Assistant. *Innovative Higher Education, 17*(3), 149-163. doi: 10.1007/BF00915598

Stevenson, I., & Jenkins, S. (1994). Journal writing in the training of International Teaching Assistants. *Journal of Second Language Writing, 3*(2), 97-120. doi: 10.1016/1060-3743(94)90010-8

Strauss, A., & Corbin, J. (1998). *Basics of Qualitative Research* (2nd ed.). Thousand Oaks: Sage.

Torkelson, K. (1992). *Using imagination to encourage ITAs to take risks.* ERIC Document Reproduction Service No. ED 349898.

Trebing, D. (2007). *International teaching assistants' attitudes toward teaching and understanding of U.S. American undergraduate students* (Unpublished doctoral dissertation). Southern Illinois University, Carbondale.

Wang, J., & Odell, S. J. (2007). An alternative conception of mentor-novice relationships: Learning to teach in reform-minded ways as a context. *Teaching and Teacher Education: An International Journal of Research and Studies, 23*(4), 473-489. doi: 10.1016/j.tate.2006.12.010

Warhurst, R. P. (2008). 'Cigars on the flight-deck': new lecturers' participatory learning within workplace communities of practice. *Studies in Higher Education, 33*(4), 453–467. doi: 10.1080/03075070802211828

Zhou, J. (2009). What is missing in the international teaching assistants training curriculum? *Journal of Faculty Development, 23*(2), 19-24.

Training final year students in data presentation skills with an iterative report-feedback cycle

Heather Verkade[1]

Abstract: Although practical laboratory activities are often considered the linchpin of science education, asking students to produce many large practical reports can be problematic. Practical reports require diverse skills, and therefore do not focus the students' attention on any one skill where specific skills need to be enhanced. They are also time-consuming to write and mark, limiting the speed at which feedback can be returned. To focus students specifically on the skills of data presentation and interpretation, a weakness noted in many reports in the past, students were required to produce a results figure, as would be found in a journal article, one for each of four practical topics. The students found this a challenge, but their skills improved markedly over the semester due to an efficient feedback cycle. Students were very engaged with this assessment, as it caused them to re-consider what they understood about the results of the practical. As this assessment is a small focused version of a practical report, it allows faster marking and return of practicals. This is therefore a successful method of focusing students' attention on presenting and interpreting practical results, in an efficient and cost-effective manner.

Keywords: practical reports, formative, interpretation

Practical laboratory activities have been considered central to teaching laboratory-based science since the 1890s (Adams, 2009; Hofstein & Lunetta, 2004; Hughes, 2004; Lerner, 2007). Practical activities allow a hands-on and social learning approach, provide meaningful context for both concepts and content, and allow students to exercise their observational and analytical skills (Collis, Gibson, Hughes, Sayers, & Todd, 2008; Gratz, 1990; Kirschner & Meester, 1988; Wilson et al., 2008). The learning outcomes that can be achieved from practical activities can be summarised as the following: students learn to present their practical data in a meaningful way through graphs, tables and figures; students learn to describe and interpret their results; and students learn how to consider the implications of their results in the context of the extant literature. As these components are all demonstrated in the standard professional forum for scientific results, the primary journal article, practical class written assessments can sometimes take this form. However, in undergraduate teaching a standard practical report is often used as a surrogate for the primary journal article (Corradi, 2012). Regardless of the format, formal scientific writing contains significant challenges for undergraduate students (Tilstra, 2001; Whelan & Zare, 2003). Intensive training in writing practical reports (Jones, 2009; Tilstra, 2001) or scaffolded writing approaches (Deiner, Newsome, & Samaroo, 2012; Greenbowe, Rudd, & Hand, 2007) are some of the proposed solutions to this ongoing challenge (Hughes, 2004; Walsh, Parry, & Larsen, 2010). Here, the practical report as been deconstructed, and only the results section has been used, in order to focus students on the presentation and interpretation of results.

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[1] School of Biological Sciences, Faculty of Science, Monash University, Australia, heather.verkade@unimelb.edu.au

Verkade, H.

A. Advantages and disadvantages of full practical reports

Practical reports have long been a standard assessment task in laboratory (and field) based science undergraduate teaching (Lerner, 2007). The following learning outcomes from writing practical reports can be identified:

1. Writing the introduction of a practical report gives students practice in accessing and utilising the scientific literature to summarise and present relevant information.
2. Writing a practical report requires a student to consider the purpose of an experiment in order to clearly present the results and interpretation.
3. Writing the results section of a practical report gives students practice in the presentation and analysis of experimental results.
4. Writing the discussion section of a practical report requires students to link their observations with the scientific literature and to consider the broader implications.

There are, however, some important limiting factors when using practical reports as assessments:

A. Practical reports are time-consuming for the student to write. In a unit/class with both practical and lecture/tutorial components, the lecture-based final examination is often heavily weighted in the final mark, causing students to become frustrated at the large amount of time spent writing multiple large practical reports.
B. Practical reports are time-consuming to mark. Paying teaching associates for marking is a significant component of many teaching budgets, especially with large (and increasing) class sizes. For many providers of higher education, there is pressure to reduce teaching budgets without compromising learning outcomes (Hughes, 2004; Watson & Knight, 2012).

The students in this final year unit/class are already proficient at the research skills described in advantage 1. However, they need improvement in the middle-order skills of demonstration, analysis and interpretation, which form part of advantage 2 and 3, and which would be specifically encompassed in the results section of a practical report. They also need practice with the higher order skills of evaluation and comparison, advantage 4, which is encompassed in the discussion. These discussion skills, however, can be assessed by a series of carefully constructed 'analysis questions', requiring students to consider the practical results in light of the information from the lectures, and the scientific literature. This is a commonly used method to guide the students' thinking and analysis (Hughes, 2004). In this study, reduced-size practical reports were used to balance the advantages of practical reports with the disadvantages of the time spent writing and marking. The aim was an assessment task that provides meaningful practice to students in advantages 2 and 3 (the demonstration, analysis and interpretation of results) as well as retaining advantage 4 in the form of analysis questions, while reducing the student and marker workload.

B. Replacing full practical reports with a Results Figure and Analysis Questions

In 2012, this unit/class contained four practical classes with written assessments and a lecture component with a final exam. In previous years, this unit/class only required a full practical report for one of the practicals. The other three were assessed with guided analysis questions, which aimed to probe the students' understanding of the concepts covered in the

71

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In 2012, this unit/class contained four practical classes with written assessments and a lecture component with a final exam. In previous years, this unit/class only required a full practical report for one of the practicals. The other three were assessed with guided analysis questions, which aimed to probe the students' understanding of the concepts covered in the

71

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71

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Verkade, H.

practical, and to some extent, their ability to use the literature to find information. The analysis questions thus provided practice in advantage 4, listed above. However, the students did not spend time considering their experimental results. In 2012, the assessments of the practicals were altered so that all four of the practicals required the students to present and interpret the practical results. This written assessment was designed as a much smaller assessment task than a full practical report. The assessment task consisted of:

1) Answers to guided Analysis Questions: 75% of the mark. Questions designed to probe the students understanding of the content and concepts from the practical class and the associated lectures, and their interpretation of how the experimental result fits in with current knowledge
2) A Results Figure: 25% of the mark. The students presented and interpreted the results from one of the experiments in the practical class. The Results Figure required:
    a) Figure panels showing the data as labelled graphs or images with suitable labels and/or arrows
    b) A figure legend explaining the figure panels, as would be expected in a journal article
    c) A results paragraph describing the experiment and the results, with the level of interpretation expected for the results section of a journal article

Teaching associates marked the assessments using the marking guide (provided to the students in advance), giving written feedback and referring to a general feedback sheet, the 'guide to common mistakes'. These were returned to the students before their next practical assessment was due. As the formats were standardised, and the students received timely feedback, these assessments provided a formative opportunity for improvement across the four practical assessments.

The educational (and administrative) aims guiding these changes were:

Aim 1. To provide the students with the level of practice in demonstration, analysis and interpretation of results that they would get from four full practical reports.
Aim 2. To limit the marking by tutors or academics (to less than four full practical reports).
Aim 3. To increase the efficiency of marking such that each practical assessment can be returned to the student with clear feedback before the next assessment is due, so as to develop a formative feedback cycle.

I. Methods

The class was a final year (3rd year) unit/class taken predominantly by Bachelor of Science students. Ninety-three (96%) students took part in this study. The four practicals were: one week examining *C. elegans* vulval development and two weeks each examining *Drosophila* terminal patterning, zebrafish neural specification and *Arabidopsis* flower patterning.

The assessments were marked by Teaching Associates using a marking guide (Appendix 1). Together, these four practical reports contributed 24% of the mark for the unit/class. As the results figures are 25% of each practical assessment, they therefore contributed 6% to the final mark of the unit/class. For the final assessment task, the students were required to select one of their four results figures on which to write a full practical report, with the intention that they would take their results figure, which they could improve based on the feedback, and add an introduction and discussion.

The marks of the practical assessments were analysed in Microsoft Word Excel 2007 and IBM SPSS Statistics 20. A Kolmogorov-Smirnov test of normality returned Asympt. Sig. (t-

72

tailed) = 0.169, 0.408, 0.221 and 0.020* for the distributions of results figure marks from the four practicals respectively, and 0.191, 0.101, 0.070, 0.139 for the distributions of the analysis questions marks from the four practicals respectively. These tests indicate that all are in normal distributions except for the fourth results figure marks (shown with an asterisk), so it was decided that these data could reasonably be represented using the parametric descriptives of mean, standard deviation, standard error and quartiles. However, non-parametric statistical tests were used for the fourth results figure marks.

Two questionnaires were administered to the students, in the first and last week of semester. The first was administered in class by paper, and returned 89 responses (96% of 93 students). The second was administered online, and returned 57 responses (61% of 93 students). Effect sizes for Wilcoxon signed-rank tests were defined using the Cohen (1988) criteria (Cohen, 1988).

II. Results

A. Students showed improvement in the skills of results presentation and interpretation

Of the 93 students, 84 (90.3%) submitted all four practical assessments, 6 (6.5%) submitted three and 3 students (4.3%) submitted only two. Across the semester, only 10 students failed to submit a results figure when they did submit answers to analysis questions (2.8% of the total of 360 submitted assessments). The general trend from previous years was that, if practical assessments consist only of analysis questions, the students achieve similar marks across all four assessments. This is presumably because each of the practicals tests different knowledge and concepts, as they each use a different model organism and study a different developmental process. This trend was observed in the students' marks in 2012. The mean marks of the students' analysis questions were very similar across all four practicals, at 79.0% ±2.0, 75.9% ±1.5, 77.6% ±1.4 and 75.2% ±2.0 (standard error of the mean) respectively (Figure 1). In contrast, the results figures improved over all four practicals, with means of 59.6% ±2.5, 63.3% ±2.3, 66.9± 2.4, and 76.1% ±2.3 (standard error of the mean) respectively (Figure 1). For this analysis, the 0 marks for students who failed to include a results figure for their report were removed. Interestingly, for their first practical, the students' results figure marks were significantly lower than their analysis question marks by a paired-samples t-test, t (88) = 7.969, p <0.001 (two-tailed). Indeed, the mean of the first results figure marks was 59.6 ± 2.5 compared to a mean of 79.0 ± 2.0 (standard error of the mean) for the first analysis questions, suggesting that this is a challenging assessment and many students were not yet clear on what to do.

A different way of visualising the improvement in student marks can be seen in the medians of the results figure marks, which increased from 60.0 to 80.0 (Figure 2). The overall improvement in the results figure marks can be seen by the increase in the quartiles (Figure 2), showing an increase of 40% to 65% in the 25th quartile, and an increase of 80% to 90% in the 75th quartile. The long tail down to very low marks was retained across the four results figures, indicating a small number of non-engaged students.

Considering each student individually, 68 (77.3%) of the students scored a higher mark for their fourth results figure compared to their first. Another 8 (8.6%) of the students scored the same mark for each, and 17 (18.3%) scored lower marks for their fourth results figure. Of these 17, 5 had submitted less than 4 reports, leading to less opportunity for practice. A Wilcoxon signed-rank test revealed a statistically significant increase in each students' marks for the results figures

73

from practical 1 to practical 4, $z = -5.815$, $p < 0.0001$, with a medium effect size ($r = 0.43$), compared to a small but statistically significant increase in each student's marks for the analysis questions from practical 1 to practical 4, $z = -2.151$, $p = 0.031$, with a small effect size ($r = 0.16$).
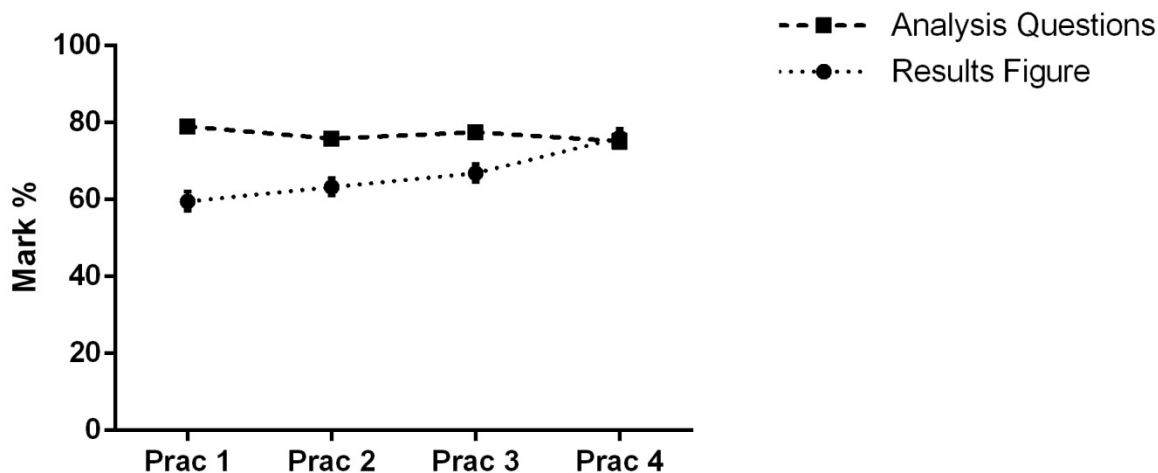

Figure 1. A comparison of the mean (and standard error of the mean) marks for the analysis questions components and the results figure components of all four practical reports.
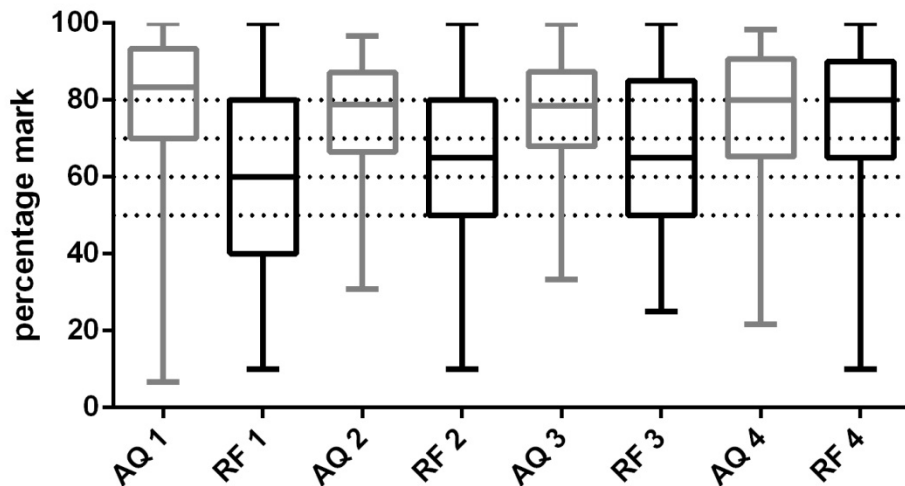

Figure 2. The distributions of marks with median and quartiles (box) and range (whiskers), for the analysis questions (AQ) and results figures (RF) of the four practical reports.

B. Students used feedback to improve their results figure for the final practical report

As a final assessment task, the students submitted a full practical report. They selected one of their four results figures and incorporated it into a full practical report by adding an introduction and discussion. Interestingly, only 53% chose their highest scoring results figure as the starting point for their full practical report. Twenty percent used their second highest scoring

74

results figure, with 14% each choosing their third or fourth. Seventy-six percent of them altered the results figure for their final prac, presumably based on the feedback they received for the initial submission. However, only 73% of these students improved their mark for the results component of the practical report. Twenty-seven percent ended up with a reduced mark, suggesting that the feedback was not uniform in its quality, and so didn't allow some of them to improve the results figure in the context of a full practical report. Overall, the students' score for the results section of the final prac report when compared to their first submission of the results figure was improved from a mean of 73.7 ± 2.1 to 79.45 ± 2.1 (n=87, standard error of the mean). A Wilcoxon signed-rank test revealed that this is a statistically significant increase in the marks between the results figure submission and the final practical report, $z = -2.188$, $p = 0.029$, with a small effect size ($r = 0.23$). Taken together, these data indicate that many students did use the feedback to improve their final mark.

C. The content of the results section improved when students could re-submit it in a full report

Isolating the results section of a practical report might cause students to invest effort in the presentation of a result, but not in the interpretation of the result. It can be argued that a results section should contain a discrete experimental conclusion (eg. The staining is higher in the mutant strain compared to the wildtype strain), but should not contain a broader conclusion, or a conclusion relating this finding to the literature. The final practical reports were examined to determine whether the results contained conclusions appropriate for a results section. This was compared with practical reports that the same cohort of students submitted in a different genetics unit/class (which is taken the semester before this unit/class). In this unit/class, 95.4% (n=87) of them provided an experimental conclusion. In their practical reports for the other genetics unit/class, 95.8% (n = 48) of these same students provided an experimental conclusion in the results. There is no statistically significant difference between these proportions (Chi-squared = 0.02, n = 48, df=1, $p = 0.887$).

In practical reports, students often confuse the purpose of a results section and a discussion section. For example, they use the results section to compare the results they obtained to the literature. They often provide a conclusion that cannot be derived from their results, but is rather derived from the literature. This has been defined as a 'broad conclusion'. In their final prac report in this unit, 19.5% (n = 87) incorrectly gave a broad conclusion in their results section. In their practical report in the other genetics unit, 25% of the same students also gave a broad conclusion in their results section, with no statistically significant difference (Chi-squared = 0.91, n = 48, df = 1, $p = 0.34$).

Interestingly, there was a small but statistically significant difference (Chi-squared = 4.533, n = 80, df = 1, $p = 0.33$) between the proportion of students who incorrectly put a broad discussion in their initial results figure (30%) compared to the proportion who had a broad discussion in the results of their final prac report (19.5%), suggesting that some students improved this for the final report. Just over twenty-five percent (25.6%) of the students also overly repeated their results in their discussion in the final practical report, indicating a misconception that the description of the results should also be in the discussion. In the other unit/class, 47.9% of these same students overly repeated their results in the discussion of their practical report, suggesting that forcing students to concentrate on the results sections before writing a full practical writing may generate a more correct distribution of information between

the results and the discussion sections. These differences are statistically significant (Chi-squared = 24.234, df = 1, p <0.0001).

D. Engagement of the students with the results figure assessments

At the start of the unit/class, 70% of the students reported that they were confident about what goes into a results section, and 67% felt confident about what goes into a discussion section (n = 89). However, 5.6% and 5.3% were not confident, respectively. By the end of the unit/class, 86% of the students reported confidence about what goes into results, and there was no change in the proportion confident about the discussion (n = 56). Despite these positive results, the smaller return rate of the post-assessments questionnaire (61%) meant that no significant difference could be found between the means of the 5 point-Likert scale for these questions, using matched responses (Wilcoxon signed-rank test, n = 56, z = 1.591, p = 0.112).

Many students gave positive comments about the practical assessments at the end of the unit/class. The following quotes are in response to: <u>Did any of the assessments/activities in this unit help you to know what goes in the results and discussion sections of a prac report? If so, which ones?</u>

By needing to do a report section for each practical to be handed in with practical reports and getting feedback, I gained a greater understanding of what is meant to be in a results section of a prac report.

All the lab reports that required a result section. With the appropriate feedback I was able to learn what does and doesn't go into the results section.

I found that the results figures for each prac report was quite a good idea as it prepares us in making results figures that are better suited to those found in real journal articles.

I found the reports for each prac helped me know what to include in a results figure, and how to incorporate it into my results section.

Yes, I kept improving my report writing skill from previous prac. The feedback in the pracs were really helpful for further improvement.

It actually helped me write a more structure and better presented results section for another subject as well as this one. I also feel more prepared for future assessments and feel more confident about how to go about it. SO all the feedback on all the topics.

However, some students reported that these assessments did not give them enough practice at formal discussion writing, as there was only one full prac report and so no formative practice. Due to constraints of marking time, this unit/class has only ever had one practical report, so it is possible that the students now recognise this deficit due to the large amount of formative practice they have at writing a result section. In response to the same question as above, some students wrote:

The discussion. I still feel uncertain when writing it, especially when I am still not particularly certain I understand what I am meant to be discussing.

Yes it did, but I still struggled with discussion, because you have to understand the concepts, and I felt that wasn't covered. I already know what goes into a discussion and results. Buts it actually writing it and having it make sense!

It was hard to tell was should be in discussion as I feel like I'm just repeating my introduction.

Although the final major report contained a discussion, we did not have any experience or relevant feedback throughout the unit in writing discussions, so this proved more

76

difficult. Perhaps it would have helped if one of the earlier prac reports had a discussion component before the final report, in order to get feedback on our ability to write a discussion and subsequently improve.

D. Marking time

In the 2011 unit/class it took up to 60 minutes per report to mark a full practical report. The turnaround was a little over 4 weeks, and as this report was due in week 9 out of 12, this pushed the mark return date into the exam period. In contrast, each results figure was marked in a little over a week, providing most of a week for the students to view their feedback before the next practical report was due. Writing four full practical reports would take a considerable amount of student report writing time. The exact time for writing practical reports, results figures and analysis figures in this unit/class is not known, however informal student comments did suggest that it was considerable work.

As far as marking costs, at this institution, 60 minutes per full practical for 77 students comes to $4210 in marking costs. For four full practical reports this would come to $16,840 for 77 students and $21,214 for 97 students. In 2012, the students submitted 4 individual practical reports consisting of analysis questions and a results figure. These took 15 – 20 minutes per report to mark. For 97 students, this came to $7350, which is 35% of the cost of marking four full practical reports for the same number of students. Although costs vary considerably between institutions, this costing arrangement would be similar across Australian universities, and with rising class sizes and contracting budgets, this is becoming a significant barrier for many of these institutions.

III. Discussion

A. This assessment succeeded in providing a formative feedback cycle

The students' marks for their analysis questions stayed generally similar across all the practicals, but the results figure marks improved. This is most likely because the skills involved in presentation and interpretation of results are generic skills, and those same skills are being applied to each of the four results figures. This gave the students the chance to practice these skills in a formative cycle, receiving feedback from each submission before the next assessment. It is common to have iterative cycles of practical report submission, but the real difference was that this assessment was small enough to allow quick marking, so that students could see their marked prac assessment before the next one was due. It is interesting to observe that many of these students did use the feedback, as this has not necessarily been the experience of others in the field (Hughes, 2004). Their results figures improved, and in questionnaire results they reported that they used the feedback for their next report. Seventy-six percent of the students changed their results figure for their final practical report, indicating that they are certainly using the feedback when it relates directly to the next assessment. The alternative approach of setting four complete practical reports as practical assessments would take the markers far longer to mark. This would dramatically lengthen the turnaround of assessment marking, and so the students would not receive their marks and formative feedback in time to correct mistakes for their next practical report submission, a vitally important part of the learning process (Kirschner & Meester, 1988; Nicol & Macfarlane-Dick, 2006; Parry, Larsen, & Walsh, 2008; Race, 2005).

B. This assessment requires less student time than four full practical reports

Despite this, the students worked hard at their results figure, often reporting that it took as long to prepare as did the analysis questions. In contrast, however, four full practical reports take far longer for the students to prepare. Indeed, lecturers have noted a reduced attendance at lectures at times when large practical reports are due. This assessment therefore provided formative practice in an important skill with four iterations, with less student time taken than with full practical reports. This frees up student time for concentrating on the lecture component of the course. This assessment was therefore successful in providing a formative feedback cycle in important skills for a relatively small commitment of student writing time as well as marking time.

C. Results figures are meaningful learning tasks

Isolating the results section of a practical report could cause students to not interpret the result of the experiment, but simply present it as a raw image/graph. However, the students did include an interpretation in their results sections in this study, and certainly they did this just as much as they would when writing a full practical report, as seen from their reports for the other unit/class. Some students also included information inappropriate for a results section, such as a broad conclusion (comparing the result to the literature), but they did so with a reduced frequency compared another unit/class, indicating that this format may improve this aspect. Indeed, some students corrected this aspect in their final practical report, suggesting that they are learning from the feedback. In addition, fewer students repeated their results in the discussion in their full practical report in this unit/class compared to another unit/class. These data indicate that isolating the results section of the practical report can actually improve students' understanding of the different components of a practical report and that the iterative nature of this assessment allows students to respond to feedback to correct their initial mistakes.

D. Problems identified

In order to successfully present and interpret results data, it is imperative that the student understand the aim of the experiment. For example, in the first practical some students interpreted the aim of the experiment as to determine the effectiveness of the experimental technique, rather than to examine the results of an experiment using that experimental technique. This is a subtle but extremely important difference. Note that a written aim was not required as part of this assessment, and so the aim interpreted by the student was inferred from the presentation of the results. In future, it is important to discuss the aim of the experiment in class and to decide on a consensus aim, so as to define the aim to be used for the results figure presentation.

Another issue was the low scores of the results figures in the initial prac. This suggests that the results figure is a challenging assessment, and that some students are initially unsure of how to prepare it. The majority of the problems arose from students not understanding the difference between the figure legend and the results paragraph (the results section describing the results and referring to the figure), many students thinking that these were the same thing. This is very interesting, because it shows that although the students are experienced at reading journal

articles, but they were not able to apply this understanding to producing their own complete figure. Clearly, this needs to be addressed in a more formal activity in which students examine the assessment instructions, marking guide, and figures in journal articles in order to make sense of the requirements. In future years, a tutorial examining the structure of a results figure in a journal article will be carried out, emphasising the three components of the figure panels, figure legend and results paragraph.

An interesting problem is that the students tend to discuss the analysis questions in the practical class with the teaching associates and the academic, but not discuss or ask about the results figures. Very few of them worked on the results figures in class, leaving them to work on them at home when they cannot ask questions. More discussion of the results figure in class needs to be actively encouraged in order to provide immediate feedback on their ideas and plans.

One downside to this approach is that the students have less practice at the important skills in writing a discussion, a problem that has been noted in similar studies (Tilstra, 2001). However, the analysis questions were designed to overcome this lack of discussion, by asking specific questions about the interpretation of the results and the broader implications based on the literature. In addition, the students in this class are already quite practiced at the skills of literature search, and summarising relevant information. The skills that they lack are the presentation and interpretation of the results. It is possible that they did already have the skills to present and interpret data, but that the particular structure of a formal prac report meant that they did not apply these skills. Even if this is the case, this assessment has caused them to focus on, and improve, these skills.

IV. Conclusion

In conclusion, practical reports can be reduced to only a results section and still retain the essential components of results interpretation and presentation. Analysis questions need to be used to ask students to more deeply consider the meaning of the experiment, and how it fits with the literature. This reduced practical report allows for quicker marking, providing a fast feedback cycle. It is also economical in terms of student writing time and marker time, the latter providing a cost saving for the Department.

Appendix. Marking guide for results figures

INSTRUCTIONS FOR WRITING PRAC REPORTS IN GEN3030

Reports for Topics 2,3,4,and 5

Each of these practical reports will consist of two parts.

Part 1: Answers to the Analysis Questions, which are numbered in the prac. The marks allocated to each question are indicated. Part 1 accounts for 75% of the marks for the prac.
Part 2: A Results Figure. For this section, you will submit a journal article-style figure reporting one of the results from the prac. The specific experimental results to be reported are indicated in the relevant prac. Part 2 accounts for 25% of the marks for the prac. Part 2 from one of these four pracs will also be used in and contribute toward your Major Prac Report (see below).
The Results Figure should contain:
- Panels with drawings, pictures taken in the prac, or graphs of numerical data.
  - If there are multiple panels, they should be labeled with A, B, etc.
  - You may need to use arrows or other indicators in the figure to demonstrate the result.
- A comprehensive figure legend that includes sufficient information to completely understand the results shown in the figure.
- A written results paragraph that explains the experiment and the result, as would appear in a journal article.

Use the figures and text from primary journal articles in the field of Developmental Genetics as your guide.

Assessment Criteria for Results Figure	
The figure panels present the data clearly and understandablly	40%
The figure legend is comprehensive and understandable	30%
The results paragraph contains a correct explanation and interpretation of the results	15%
The results paragraph is appropriate for a results section, and does not contain significant amounts of discussion.	15%

References

Adams, D. J. (2009). Current trends in laboratory class teaching in university bioscience programmes. *Bioscience Education, 13*. doi: 10.3108/beej.13.3

Cohen, J. W. (1988). *Statistical power analysis for the behavioural sciences* (2 ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Collis, M., Gibson, A., Hughes, I., Sayers, G., & Todd, M. (2008). The student view of 1st year laboratory work in the biosciences — Score gamma? *Bioscience Education, 11*. doi: 10.3108/beej.11.2

80

Verkade, H.

Corradi, H. R. (2012). A sample practical report to facilitate writing in the scientific style. *Biochemistry and Molecular Biology Education, 40*(1), 65-67. doi: 10.1002/bmb.20571

Deiner, L. J., Newsome, D., & Samaroo, D. (2012). Directed self-inquiry: A scaffold for teaching laboratory report writing. *Journal of Chemical Education, 89*(12), 1511-1514. doi: 10.1021/ed300169g

Gratz, R. K. (1990). Improving lab report quality by model analysis, peer review, and revision. *Journal of College Science Teaching, 19*(5), 292-295.
Greenbowe, T. J., Rudd, J. A., & Hand, B. M. (2007). Using the science writing heuristic to improve students' understanding of general equilibrium. *Journal of Chemical Education, 84*(12), 2007. doi: 10.1021/ed084p2007

Hofstein, A., & Lunetta, V. N. (2004). The laboratory in science education: Foundations for the twenty-first century. *Science Education, 88*(1), 28-54. doi: 10.1002/sce.10106

Hughes, I. (2004). Coping strategies for staff involved in assessment of laboratory write-ups. *Bioscience Education, 3.* doi: 10.3108/beej.2004.03000005

Jones, H. (2009). Teaching undergraduates to write practical reports. *Centre for Bioscience Bulletin* 26. Retrieved from
http://www.bioscience.heacademy.ac.uk/ftp/newsletters/bulletin26.pdf

Kirschner, P. A., & Meester, M. A. M. (1988). The laboratory in higher science education: Problems, premises and objectives. *Higher Education, 17*(1), 81-98. doI: 10.1007/BF00130901

Lerner, N. (2007). Laboratory lessons for writing and science. *Written Communication, 24*(3), 191-222. doi: 10.1177/0741088307302765

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199-218. doi: 10.1080/03075070600572090

Parry, D., Larsen, C., & Walsh, C. (2008). Summative assessment with formative feedback: An intervention in a small bioscience cohort. *Bioscience Education, 11*. doi: 10.3108/beej.11.c2

Race, P. (2005). Learning through feedback. *Making learning happen*. London: Sage.

Tilstra, L. (2001). Using journal articles to teach writing skills for laboratory reports in general chemistry. *Journal of Chemical Education, 78*(6), 762. doi: 10.1021/ed078p762

Walsh, C., Parry, D., & Larsen, C. (2010). Blending learning: a novel assessment strategy enhancing student learning from practical work in the laboratory. *Bioscience Education, 15*. doi: 10.3108/beej.15.c2

Verkade, H.

Watson, D., & Knight, G. L. (2012). Continuous formative assessment and feedback in an enquiry-based laboratory course. *Bioscience Education, 20*, 101-105. doi: 10.11120/beej.2012.20000101

Whelan, R. J., & Zare, R. N. (2003). Teaching effective communication in a writing-intensive analytical chemistry course. *Journal of Chemical Education, 80*(8), 904. doi: 10.1021/ed080p904

Wilson, J., Adams, D., Arkle, S., Bevan, R., Boachie-Ansah, G., Bradshaw, T. . . Wilson, J. (2008). Report: 1st year practicals: Their role in developing future bioscientists.   Retrieved from www.bioscience.heacademy.ac.uk/ftp/reports/pracworkshopreport.pdf

Is Twitter an effective pedagogical tool in higher education? Perspectives of education graduate students

Krishna Bista[1]

Abstract: This study presents the perspectives of education graduate students of using Twitter as a pedagogical tool for 15 weeks as a required social media activity in class. The results indicated that participants in each course reported a positive learning experience of using Twitter. Although this was their first experience with Twitter, participants reported that Twitter provided space and opportunities to engage in academic activities as a new pedagogical tool. Participants reported they used Twitter to receive immediate and frequent course information, ask questions to the mentor, update course assignments, and to share helpful information from outside the textbook with their fellow classmates and mentor. This study also highlights suggestions and implications for utilization of Twitter in personal and professional development.

Keywords: Twitter, student engagement, higher education, pedagogy, professional development, social media, graduate student

An important tool I learned to use this semester was Twitter. I would have never conceived that I would be discussing academics in the social media as we did. At first I was extremely uncomfortable using Twitter. Later, it became second nature and was easy. Twitter was a great way to stay abreast of what was going on in our class. Next semester, I will be like an old hand at Twitter!

<div style="text-align: right">(Annette Smith, MEd Special Education)</div>

I. Introduction

Twitter is a social networking site that offers micro blogging services to interact via Twitter posts, also called tweets, on Smartphones, laptops, iPods, and any devices with Internet access. In the past few years, researchers have significantly studied online social networking sites (e.g., Facebook, Twitter, LinkedIn, and YouTube) to examine the relationship between educational outcomes and social networking (Bista, 2014; Gouseti, 2010; Kirschner & Karpinski, 2010), student and faculty relationships (Malesky & Peters, 2013; Veletsianos, 2012), and student engagement and social presence (Dunlap & Lowenthal, 2009; Junco, Elavsky, & Heiberger, 2013). Today, students and instructors are socially networked among their peers and friends. According to the *Faculty Focus* survey, 16.5 percent of higher education faculty out of 840 participants reported using Twitter daily compared to 44.6 percent of faculty using Facebook (Bart, 2011). Recent reports indicated Twitter is experimented as a classroom tool in high school (Antlfinger, 2014; Lang, 2013; Vooren & Bess, 2013) and university classroom learning (Lin, Hoffman, & Borengasser, 2013; McArthur & Bostedo-Conway, 2012; Springer, 2014).

This study presents the perspectives of graduate students using Twitter as a pedagogical tool for 15 weeks as a required activity in the class. Is Twitter an effective teaching and learning

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[1] Assistant Professor of Education, University of Louisiana at Monroe, bista@ulm.edu

tool in higher education? What do students in the master of education programs say about their experiences of using Twitter in a semester long course? Are they going to use it as a personal and professional tool after the completion of the course?

II. Literature Review

A. Twitter and Its Classroom Usage

Launched in October 2006, Twitter has become an information networking tool that allows users to post a topic or a discussion no longer than 140 characters. Twitter includes several features for sharing information such as a timeline (chronological display of messages) and other settings, either private or public. In the past few years, professional learning communities have incorporated social media as pedagogical tools inside and outside the classroom (Bista, 2014; Blair, 2013; Rockinson-Szapkiw & Szapkiw, 2011). A few studies show a significant positive role of social sites in communicating with students as a learning tool in the classroom (Aspden & Thorpe, 2009; Junco, Elavsky, & Heiberger, 2013; McArthur & Bostedo-Conway, 2012; Veletsianos, 2012).

Twitter, as an emerging social media, has been narrowly used in college classrooms across disciplines. Educators and practitioners do not recognize its value in terms of a teaching and learning tool. As indicated in the *Faculty Focus* (2009), more than half of nearly 2,000 faculty participants responded that they had never used Twitter. Of the total, 30.7 percent of faculty reported using Twitter, and less than half of them used Twitter to communicate with students. The remaining 12.9 percent of respondents said they tried Twitter in the past but no longer use it. The majority of participants who did not use Twitter questioned the educational relevance of Twitter, "expressed concerns that it creates poor writing skills," and expressed the fact that they did not know how to use Twitter or didn't have time to use it (*Faculty Focus*, 2009, p. 2).

The faculty who used Twitter reported a variety of reasons for using it: "to share information with peers," "as a real-time news source," instructional uses such as "to communicate with students" and "as a learning tool in the classroom" (*Faculty Focus*, 2010, p. 2). In a quantitative study, McArthur and Bostedo-Conway (2012) reported significant positive correlations between student Twitter-use and learning. The authors have recommended the use of Twitter for teacher-student interactions and lifelong learning experiences. While using Twitter among undergraduate and graduate students as an extra credit assignment, Lin, Hoffman and Borengasser (2013, p. 39) found that "students enjoyed being consumers of tweets but seldom retweeted or replied."

Educators have experimented with using Twitter in teaching a variety of courses including history, geography, business and language learning. For instance, Yuan (2012) used Twitter English writing and reading in a Taiwanese college. In another mixed method study, Luttrell (2012) examined the effectiveness of Twitter and other social medial in comprehension and application of public relation course material among undergraduate students.

The use of Twitter is suggested to enhance the social presence of students (Al-Khalifa, 2010; Dunlap & Lowenthal, 2009; Lang, 2013). Social presence refers to the "ability of participants in a Community of Inquiry to project their personal characteristics into the community, thereby presenting themselves to other participants as 'real people'" (Garrison, Anderson, & Archer, 2000, p. 89). In a study conducted at the University of Colorado at Denver,

the instructors used Twitter to encourage their students to post in a variety of ways: to post questions and queries to one another, send student to student direct messages, share resources, link to student blogs, comment on conferences that their friends were attending, and exchange personal information (Chichester, 2010; Dunlap & Lowenthal, 2009). The authors have reported that Twitter can enhance students' perceptions of a sense of "social presence" that helps promote student involvement, commitment, and retention. Because of its flexibility, the Twitter platform is also recommended as a virtual office (Al-Khalifa, 2010). Twitter enables students to participate in a wide range of interactions from private messages, to arranging meetings, and to engaging in learning processes (Al-Khalifa, 2010; Bista, 2014; Dunlap & Lowenthal, 2009; McArthur & Bostedo-Conway, 2012).

A few studies indicated the role of Twitter in establishing a collaborative learning relationship between students and instructors through the process of sharing ideas, resources and reflections (Blair, 2013; Ebner, Lienhardt, & Meyer, 2010). In addition to classroom pedagogy, Salter (2012) has offered tips about using Twitter in the conference backchannels (i.e., include a Twitter handle on every slide, use Twitter-friendly links). Twitter enables conference participants and speakers to actively engage in discussion, since the users can tweet micro-feedback and responses in real time (Priego, 2011). Beyond its use in marketing and recruitment, Twitter has grown its application in the classroom and professional development.

B. Twitter and its Debate

There is an ongoing debate among educators as to whether social media is an appropriate application for the classroom. Social media policies in the K-12 school setting and in the institutions of higher education vary in the United States. Some school teachers and faculty members have adopted a zero tolerance of social media policy, especially the use of Facebook and Twitter in the classroom whereas some are flexible regarding application of social media (Galagan, 2010; Lang, 2013; Metteson, 2010). Rockinson-Szapkiw and Szapkiw (2011) mentioned that Twitter encouraged students in "critical thinking, synthesis and evaluation throughout learning process" (p. 360). Research has reported positive relationships between Twitter use and student engagement where students used Twitter in educationally relevant and productive ways (Junco, et al., 2013; Junco et al., 2011).

Twitter may not be appropriate for all instructional situations based on the nature and demand of the courses. Grosseck and Holotescu (2008) have identified Twitter as time-consuming, addictive, and possibly even a way to encourage bad grammar as a result of its 140-character limit. In addition, students and faculty may be charged data fees if they access Twitter on their cell phones. For example, the online surveys that faculty want to connect to on their Twitter pages may require a subscription fee. Furthermore, participants in a study who used Twitter in the classroom have expressed frustration and anxiety (*Faculty Focus*, 2009). The faculty participants reported several negative comments about the use of Twitter such as, "It's mostly a waste of time and energy," "I have enough other ways to waste time," "It's beneath my dignity," and "I am sick of student writing that is unprofessional. I am also tired of receiving student work that has incomplete sentences, fragments, subject-verb agreement mistakes, point of views mistakes, tense mistakes" (*Faculty Focus*, 2009, pp. 5-6).

Although there are a few studies on how Twitter can be used for undergraduate students or whether faculty were interested or not interested in using the tool, there are not enough studies analyzing whether graduate students with an education major consider Twitter in their

classroom or for their personal and professional development. What do graduate students in education programs (e.g., master of education in reading, educational leadership, curriculum and instruction, educational technology, special education, instructional leadership, and master of arts in teaching) who are currently teaching at schools or are administrators think about the use of Twitter? In this context, the current study aims to examine the perceptions of graduate students in education programs regarding the use of Twitter as a pedagogical tool. Therefore, this study aims to answer the following questions:

1. What are the perceptions and experiences of graduate students in education programs for using Twitter as a learning tool in a semester long course?
2. Do graduate students in education programs perceive Twitter as a classroom engagement tool in higher education?
3. How likely are these graduate students in education programs to use Twitter professionally within the next two years after the completion of the course?
4. Do graduate students in education programs recommend the use of Twitter in any future graduate classes?

II. Research Method

This study is a qualitative case study in nature. Yin (2013) defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context. Case study is used to "examine contemporary real-life situations and provide the basis for the application of ideas and extension of methods" (Yin, 2013, p. 23). Researchers have defined a case as an object or entity (e.g., a student, a classroom) or an event (e.g., a campus protest) or a process (e.g., becoming a professional teacher) or a metaphor (Creswell, 2013; Johnson & Christensen, 2014; Mertens, 2015; Yin, 2013). Case study is a research model within naturalistic research methodologies which allows researchers to investigate single or multiple units (Creswell 2012; Yin 2013).

This case study attempts to describe Twitter's use as a pedagogical tool among graduate students at one public university. It focuses on the process and results of having used Twitter among students. This case study design is an instrumental case study (see, Johnson & Christensen, 2014, p. 436) where the primary interest of the researcher is in understanding student Twitter use in learning - how and why students use it and how effective they find it in their learning process. Johnson and Christensen (2014) said, "The instrumental case study is popular with many academic researchers when they are interested in generalizing and extending the findings in research literatures on various topics" (p. 436).

The researcher examined student written assignments from the selected courses. The researcher also examined 2,414 tweets collected from the course Twitter page, collected over the period of 15 weeks from the course participants. Participants engaged in the course Twitter Page from August through December of 2013.

A. Participants and Contexts

The participants were Twitter-using graduate students. Of 42 students included in the study, 31 were females, seven were males, and four did not identify their gender. The average age of participants was 34 years. All names of participants are pseudonyms to protect their confidentiality. The participants were enrolled in a required course in their master of education

programs with various concentrations (e.g., educational leadership, curriculum and instruction, special education, elementary education, gifted and talented education, reading, and English as a second language). During the course, participants participated on the designated Twitter page for 15-weeks. Each participant posted at least two tweets weekly on the course Twitter page. This case study was drawn from two classes where students had taken the same course for a semester. Undergraduate students or graduate students from other departments and disciplines or courses were not recruited.

This study was initiated at a co-educational public university of about 9,000 students in the mid-southern United States. There were about 8,000 undergraduate students, and 1,000 graduate students as of 2013. For this study, two online graduate education classes titled "Teacher Leader I: Introduction to Educational Research" were chosen and all students enrolled (i.e., 42 participants) were invited to participate in the study. Twitter was used as a supplement in addition to the course learning management system, Moodle.

B. Procedures

The researcher obtained an approval from the Institutional Review Board (IRB) for this project. The procedures of this study involved the following three steps: First, a course Twitter page was developed at the beginning of the course and implemented in the class with policies and procedures for use. Second, the students were required to write reflection papers at the end of the semester. Course reflection papers and tweets collected from the Twitter page were analyzed using charting and theme analysis. In their reflection responses, students were instructed to reflect on the reading materials and instructional media (video clips, websites and other resources) used during the course. The average length of the essay was one and half page. Of 42 course participants, 27 participants wrote about their experiences of using Twitter (in addition to their experience of using other research tools such as drop box and survey monkey websites); 15 participants did not mention their Twitter experiences in their essays (but reflected on other course materials). Third, an online survey questionnaire was administered at the end of the semester to examine their experiences of using Twitter.

All participants tweeted to course Twitter pages for 16 weeks. The researcher analyzed all collected qualitative data (written responses, tweets, and survey data) separately. Written responses and tweets were evaluated using the document analysis technique. Both student responses and tweets were categorized into groups according to their relationships or themes. In other words, materials were sorted by categories, identifying similar phrases, patterns, relationships, and commonalities (Creswell, 2012; Schreier, 2012). The researcher evaluated quality and appropriateness of contents of these tweets and written responses in relation to the course syllabus (Educational Research). The process of analyzing responses consisted of identifying significant statements, sentences, or quotes that conveyed participants' experiences from the Twitter page and written responses submitted during the semester. Such information was categorized based on themes for analysis (Creswell, 2012). While analyzing data, the researcher mainly used percentage and some demographic information. Conclusions were then drawn based on: 1) the individual and collective responses of the participants' Twitter experiences, 2) content analysis of tweets, and 3) the responses received from a brief online survey.

C. Role and Perspective of the Researcher

At the time of this study, the researcher had general information about Twitter but had not used it for the classroom purpose. The researcher had a personal Twitter account used rarely to share information with friends. Twitter was selected for the classroom purpose over several other social media sites (compared to LinkedIn, Facebook, and Pinterest) because it has manageable applications and privacy settings. The researcher selected Twitter because of its simple application. Compared to multiple options available on Facebook, Twitter was an ideal tool to use among graduate participants who were also full time employees in the K-12 school settings at the time of this study.

The researcher taught in the college of education at the university where the study was conducted. The researcher had experiences of teaching online courses but never used Twitter as a course teaching tool before. The researcher used the course Twitter page for two sections of his/her online graduate course titled "Introduction to Education Research." Because of the online nature of the course, both the course participants and the researcher did not have any face-to-face interactions during the course. The researcher was open and flexible with the tweets posted by the course participants; however, students were required to post or re-tweet course related information weekly as the guidelines provided at the beginning of the semester in August 2013.

D. Course Twitter Page

The researcher, also course instructor, created a Twitter account following the link https://twitter.com/ and by filling out the required information (e.g., name, e-mail, password, department or college link, a brief bio). Then, the researcher selected the options under the profile setting which allowed the user to select whom to share information with and how to protect information from people outside of the class. Finally, the researcher invited the 42 course participants (i.e. all participants of the course) to join the Twitter class account via their school email address. Each course participant was required to post course related information weekly (i.e. video links, news related data and research, pictures, questions related to assignment, due dates and course announcements). The researcher also assigned a grade that would count towards the course final grade. Since this Twitter page was used for the online class, the researcher monitored the Twitter page at least twice a day for 15 weeks to ensure active participation of students, and quality of contents posted on the page. The course participants were asked to post complete and meaningful sentences instead of shortened text messages.

In this study, the researcher followed the guidelines, as offered by Dunlap and Lowenthal (2009) in their research, while using Twitter with graduate students in the online course:

a) The instructor of the course shared a purpose of using Twitter for the class to foster academically meaningful interactions.
b) The instructor defined expectations for course participations to share their tweets instead of designing it as a requirement. Students were asked to log into Twitter twice a week for fifteen weeks to share/update course related information.
c) The instructor presented an active participation in Twitter by tweeting current information about the course, by asking questions, and by sharing resources in the area of student interests.

d) The instructor asked students to continue their presence in the Twitter community after courses are completed in December 2013 to build their own professional and academic connections with friends, peers, and professionals.

III. Findings

The findings (from the participants' written responses, the brief questionnaire, and the course Twitter page analysis) indicated that Twitter was a meaningful learning experience for all course participants. There were 2,414 tweets collected from 40 participants by the end of the semester. Of 42 participants, two participants became inactive as they dropped the course. In the online questionnaire administered at the end of the semester, only 27 members participated. The following sections will describe a) the written responses of 27 participants regarding their perceptions of Twitter use, b) the 27 responses collected via brief online survey, and c) the selected 2,414 responses from the course Twitter page.

Qualitative data analysis revealed the following themes relating to academic practice and activities of Twitter among graduate students. These are described below using illustrative tweets. Twitter identifications were edited to maintain participant anonymity.

Table 1

Graduate Students' Twitter Usage in Academic Activities

Theme	*Theme description*	*Example of student written responses or tweets*
Change in students' perspectives	Uneasy experience to sign up for a course Twitter page; total surprise; fun to use and very helpful	"…I will admit that I thought it was a waste of time."
Professional value	Developed professional network among peers and professor; wanted to use beyond classroom; shared information and resources with peers	"I enjoyed the quick responses in which questions were answered…"
Academic learning experience	Learned how to tweet, seek course related information to post on the Twitter page; found difficulty in using; asking for and providing support to others	"I had never used Twitter before this course. I look for videos or interesting things to post on Twitter often"
Challenges while using Twitter	Signed up for the first time; difficult to keep up with course related materials; found challenging	"It was a little difficult to remember to check it and most on it from week to week."
Student engagement	Used to ask questions, led discussion; shared quick and constant feedback; kept updated with each other; interactions; like and dislikes	*@ariel2: Bias, bias everywhere! Reading Ch. 8 has made me realize how hard it is to get a truly representative sample of a population.* *@bernarjn: I just posted my questions under Group A. I hope to hear from my group soon!*

A. Themes Emerged from the Student Written Responses

The majority of the course participants, at the time of signing up for the course, did not expect the instructor would use Twitter as one of the required activities throughout the semester. As the instructor and the participants did not have much experience of using Twitter as a learning tool, the majority of participants in this study expressed their first encounter with Twitter in this class. They shared their first experience of setting up an account for Twitter, what to post, how often to post, and how it works overall. As a majority of course participants were school teachers, administrators and instructional technologists in the public school systems in the US, they were not considering the value of Twitter as a classroom tool.

B. Change in the Perceptions

Participants were surprised to use Twitter in the graduate research class. At first, they expressed uneasy feelings about signing up for a course Twitter page and tweeting the information that counted for the course grade. Adele Hardman, an MEd student in Curriculum and Instruction, wrote how her perceptions of using Twitter changed over the course:

> Who would have ever thought it would have been a class requirement to have a twitter account? I sure would not have. It definitely caught me by surprise. Since social media has such a large influence on today's society, I thought it was an awesome way to get all the participants involved. It was a great way for us to share current news related to our study and educational happenings with our colleagues. It was interesting to see the different perceptions and thoughts others had on the hot topics, such as Common Core State Standards, of the educational world.

Like Adele, another course participant also expressed her discomfort with using Twitter initially and how it became a useful tool later:

> When I first found out that the course had a Twitter page that we were required to comment on at least twice a week, I will admit that I thought it was a waste of time. As the course has progressed I have come to love the course Twitter page. This page allows the students to communicate with and receive feedback from the professor very quickly. It is also beneficial that all the members of the class can see both the question that was posed and the response that was given. I will admit that this is my favorite part of the Twitter idea, because my classmates often have some of the same questions that I do and rather than the professor having to answer the same question forty-five different times, he only has to answer it once and everyone that visits the page can see it. Overall I believe that the Twitter page was very beneficial and would love for some of my other professors to follow suit and create class Twitters.
>
> (Aileen Linder, MEd in Educational Leadership)

Although many course participants were first time Twitter users in the online graduate course, these participants soon realized the benefits of their presence on the Twitter page. Alice Plauche, an MEd student in Reading wrote, "Twitter has been a lot of fun to use and very helpful. It served as a more personal form of gathering information and seeing what other people are interested in. This was a great idea for this class because it allowed us to communicate

through social networking, which is extremely popular in today's time." As the instructor posted important announcements on the course page and fellow classmates started posting interactive discussions, participants of the course gradually saw changes in their original perceptions. Allison McCormick, another MEd student in Instructional Leadership shared, "Using twitter for this course helped me. I enjoyed reading all the comments and posts of research articles and videos. I learned a lot about different topics in education and seeing the views of students in our class. I think using twitter is a good idea." Course participants reported that they enjoyed not only posting current information on the course Twitter page, but also staying in touch with their fellow classmates:

> When I think of Twitter, I never thought of it as being a learning tool. I was initially apprehensive about using this type of social media for a class, but I quickly realized how beneficial it was. I believe that our course Twitter is an effective and efficient way to communicate soundly amongst each other in an unconventional manner. Fellow classmates and I were able to share our thoughts and words in 140 characters or less. The unique quality about our course Twitter is that we're using one of the most popular networking tools in today's society as a central location to share educational information for this course. For me, being able to connect with fellow classmates via twitter allows me to not only interact with them about current topics, but embrace their thoughts and ideas as well.
>
> **(**Amanda Armstrong, MEd Candidate in Reading)

C. Professional Value

As an instructor of the course, the researcher was interested in exploring whether the course participants would see a professional value of Twitter in higher education or other school settings or for developing a professional network among peers and colleagues. A few participants of this study shared their positive views regarding the usage of Twitter in professional development. Arthur Hobson, MEd student in Educational Leadership suggested, "Twitter has been very interesting to see all the different classmates' works, surveys, and comments. This has allowed me to learn about a new tool for educators to use for instruction. Maybe not in middle school, but definitely could be a tool for high school students." Another participant, Ariel Smith, MEd in Instructional Technology saw the value of Twitter in her personal growth: "I have also continued to interact with my classmates on Twitter and completed some outside reading assignments."

Like Arthur and Ariel, another graduate student in Educational Leadership, Amy Willis, noticed the use of Twitter at a different level, and was interested to experience it personally in her professional development:

> I have really enjoyed following my classmates and reading and responding to their posts and links to articles. My principal actually runs an account for our school where he tweets educational articles, posts, and updates related to our school and the educational field. We have many parents that follow the school, and I think that is really neat! I have also began to follow many other educational leaders and bloggers to stay up to date with important information that I am unable to attend, such as major educational conferences across the US. I probably spend a little too much time on Twitter reading educational information, but hey, you can never read or learn too much, right?

Anastasia Griffin, an MEd student in Special Education who was taking this online class from South Africa, shared her adventure of using Twitter and Facebook in the course, and that now her school in South Africa has also opted to use Twitter as a communication tool:

> I have been pleasantly surprised to find that I enjoyed the social networking part of this class. Not having been one to be much on my husband's Facebook account (until this class I never had my own), and never having any desire to open a Twitter account, I've found it fairly remarkable to learn their true value in education. Twitter has been very useful; I've felt in prompt communication for our class. It's easy for me to see how easily that knowledge could be transferred to my Facebook site as well. Interestingly, the International School of Ouagadougou has, at the same time, determined that both FB and Twitter will be helpful communication tools for the school.

Angela Sirius, an MEd in Curriculum and Instruction, enjoyed the course Twitter page setting that allowed only the course participants to share their information and was looking forward to using a Twitter page in her school for the parents of her first grade students:

> Twitter has been a great way to get my thoughts out to others in the class quickly and efficiently! I have loved reading articles that a classmate or professor link to a tweet from my smart phone. I have been doing a little research about Twitter in the classroom, because I am interested if it would be a good way to communicate with the parents of my first graders. I like how we were only allowed to add people that are in our class, and that is what I would have to do if I opened it to my parents. There are lots of times in the day that I would love to send a picture or link to something great we are doing in the classroom. I like that it is instant! I often take pictures with my camera or phone, but it may end up being a couple of days or weeks before I get it to my parents.

Similarly to previous participants, Angela Hathaway, an MEd in Educational Leadership program, shared her learning experience, and usefulness of Twitter in her personal life:

> I believe I may have mentioned my hesitancy with using the social media site before, and it mostly stems from lack of familiarity with the site and—quite honestly—general absence of interest in the structure of the source. With Twitter, I actually had to train myself to stay concise and remain focused on the main idea. In the long run, that could probably help me out quite a bit, especially since many papers I've written have always wanted me to "get to the point." That's exactly what Twitter encourages. I will say that I find Twitter much cleaner and focused, whereas Facebook tends to get lost in advertisements and useless information most of the time.

As most of the course participants in this study were classroom teachers, they were asked "What value, if any, do you think Twitter can provide to a course?" All participants shared positive attributes of Twitter if used properly in the class. Some of the selected responses are listed below:

"Keep up to date information and interactions with classmates/teachers."
"I think it can create a central point for people to communicate and see other communications easily."
"Twitter adds the value of quick communication between classmates and the professor."
"I think it provides a great value. It is a good way to socially connect with others on a professional level."

"Great tool connect with the course materials especially in the online courses."
"Twitter can increase communication among classmates and instructors due to its easy use format."
"Twitter was helpful to link others to important topics, articles, videos, etc."
"I enjoyed the quick responses in which questions were answered. I also find the quick access to educational material through links to be very useful."

D. Learning Tool or Learning Experience?

Some participants perceived Twitter as stressful while others took it as a learning experience. As a course instructor, often the researcher was looking for a better way to manage the tweets, by themes or topics, or ways to avoid unwanted side advertisements throughout the 15 weeks of the course. The course participants reported the use of Twitter as a learning experience instead of an effective learning tool for the class:

> I had never used Twitter before this course. I look for videos or interesting things to post on Twitter often. I become so engrossed in my findings sometimes that I forget to post them on Twitter. I find myself emailing other teachers or parents that I feel my findings might be relevant. I have learned quite a bit while in search of my next tweet.
>
> (Anna Evans, MEd Special Education)

> I was really nervous about this course when I read the first assignment, and discovered I had to create and utilize a drop box and twitter account. I usually steer clear of any activities including technology, because I lack all self confidence in the department of the "cyber world". I have even put off obtaining my master's degree, because I lacked the time to take traditional classes, and was too intimidated to pursue online courses. This year alone, I have accomplished taking four online courses, and setting up two drop box accounts, plus one twitter account.
>
> (Anita Spears, MEd Middle School)

All course participants were graduate learners taking an online course, and this class was one of the first required courses in their master's degree in various concentrations. A few participants in the study reported difficulty using Twitter. After their semester long participation in Twitter, three participants did not see the value of using Twitter as a learning tool but shared their positive learning experience at the end of the semester:

> Twitter has been an issue for me since the beginning. I have never really used Twitter and am still getting used to it. I do not check as much as I probably should but rely more on Moodle and forums for my information. Twitter confuses me and I find it hard to find other participants' feedback and responses. I still post weekly on this application and hope to grow more in understanding how to navigate and develop a more usefulness for this tool in the future.
>
> (Annabel Bernard, MEd Early Childhood)

> The Twitter assignment was the most challenging for me because I wasn't used to social media such as Twitter. I've never had a Twitter account nor was I ever

interested in signing up. However, once I signed up …it certainly wasn't hard. It forced me to be more aware of articles relating to the class or education, which I thought was very helpful. I did find the Twitter assignment very useful because it allowed a sense of connection with the class participants.

(Allan Cunningham, MEd English as a Second Language)

Like Annabel and Allan, Angie Thomas, an MEd student in Special Education summarized her experience, "Twitter, I never thought that I would ever use it but, now I'm glad that I learned how to do it."

E. Challenges While Using Twitter

Participants shared a variety of reasons of why they struggled using Twitter for their required graduate class. First, participants signed up for the first time, requiring them to post certain educational information, and they lacked familiarity with the tools. Second, those participants who use Facebook reported having a different experience of using the limited space (140 characters) to share educational information with their peers and instructors. Third, a few participants said they were uncomfortable keeping up with Twitter regularly along with their busy full time schedule and course materials as a graduate student. Finally, the pre-conceived negative attitude of a few participants toward Twitter was another contributing factor to difficulty navigating the course Twitter:

The most difficult part of the course for me was to keep up with Twitter. I did not use twitter before the course and it was a little difficult to remember to check it and post on it from week to week. Also, I found it a little difficult to use and would miss tweets and re-tweets from people. I think that creating a course Facebook page would be a great way to incorporate social media into the course since most people use it and check it very often.

(Alexis Ellis, MEd Elementary Education)

I had a hard time catching on to how to use Twitter and beginning my research. I was strongly against having a Twitter account prior to this course. With this negative attitude it was hard to navigate around and I was very unsure of how to use it.

(Andrea Nettles, MEd English Education)

Twitter for me was an extra headache, as I was not previously signed up for twitter and had to create an account specifically for this course. Twitter is intended to be quick snip-bits of information, and thus the character count is limited to 140 characters per tweet. I did not have the desire to previously use twitter and still, often do not check for tweets. At this particular moment, I'm actually thinking to myself, "Did I send enough tweets to qualify for the full participation grade?"

(Alfred Helphenstine, MEd English as a Second Language)

F. Student Engagement and Likelihood to Use in the Future

Participants engaged in the course Twitter page in a variety of ways. Some shared information they enjoyed while reading course related materials such as journal articles or textbook. Others posted their dislikes to their peers and instructors. A majority of responses indicated that students used Twitter to ask questions about the class discussion or assignments as they received quick reply either from their fellow students or the teacher.

Data received from a brief online survey showed that 93.2 percent of participants agreed, "I used Twitter to get a quick response related to class project or research," whereas 3.8 percent did not agree. In another statement, 96.1 percent of participants said, "I used Twitter to discuss course readings," and 3.8 percent did not agree. Finally, 66.1 percent of participants reported, "I used Twitter to share ideas/information related to course with peers," and 33.9 percent disagreed.

The researcher also asked whether these participants will use Twitter in the near future. The participants indicated that Twitter is a useful tool in the classroom. Eighty percent indicated they are going to use in their work place and 23 percent have no plans. Ninety percent of participants are going to utilize Twitter to network with their friends and colleagues but 7.7 percent indicated they are not going to use it. Eighty five percent of participants reported that they are planning to use Twitter to communicate with teachers and 15.4 are not. Similarly, 92.4 percent of participants indicated that Twitter is a learning tool in the class whereas about 8 percent reported that it is not a learning tool.

As seen in survey data, students' written responses suggested that some participants were likely to use it for their professional development, whereas a few respondents were not. For instance, one participant said she is going to use Twitter for her personal purpose:

> Twitter was new to me.... But, this class has shown me that Twitter doesn't have to be a thoughtless bragging message board. It can actually be a place of thoughtful discussion, easy webpage and article sharing, and a place to bounce ideas off of one another. While I don't think I'd use this in the classroom with students, I do think I'll continue to follow professionals in the field of education to just stay in tuned with what is currently going on and get insight on what people are thinking.
>
> (Antonia Herr, MEd in Educational Technology)

Another participant also shared her personal reason of not using Twitter this way:

> I am not really enjoying the Twitter assignments because I am not a fan of social media. I am a more private person than most people and do not like to put my every thought on the internet. Putting things on Twitter is more of a chore for me and not something that I will continue to do after this course if it's not necessary for another course.
>
> **(**Amber Rome, Elementary Education**)**

G. Themes Emerged From Content Analysis of Tweets

In this section, the researcher included information received from the course Twitter page. Course participants tweeted twice a week for fifteen weeks per the course Twitter page guidelines. By the end of semester, there were 2,414 tweets from 40 participants. The information collected from the course Twitter page is organized in the following themes:

Questions. Participants were asked questions related to the course materials, assignments and general information using the course Twitter page. Most of the course participants were school teachers and administrators. They posted questions about how information they learned in the class can be used professionally in their everyday lives. Participants provided immediate responses, if the course materials (such as video clips, website links or audio file) did not work on their computers. The following sample tweets represented student engagement in asking questions:

Anna Molly @Anna114: so all we have left is the research paper?

Alexis Mathis @AlexisMathi: What do you think the challenges will be for testing Students with Disabilities on the Common Core Curriculum?

Assay Herr @sayherrgrn: Is there a point where too much extra-curricular or after school activities hinder academic performance?

Agatha Long @Long10: I've read the research samples. Wondering if I can tie ideas from my own class that relates to the course?

Amy Willis @amywillis: My school is asking teachers to take in students when other teachers are absent...because there is a sub shortage...thoughts?

Adeline Love @lovewl: I can't open the file with the final research paper video. Anyone else having trouble with this?

Discussion. Participants started several discussion threads on the course Twitter page on a variety of topics such as common core standards, professional developments, course materials, and their individual research topics. The instructor asked students to start these types of discussion threads. Based on the needs and interests of the participants, they started these threads. At times additional information was added to clarify information or to summarize the case that was provided. In some of the discussion posts, students shared the concepts that they differentiated and understood, and even suggested to their fellow classmates. Some of the sample discussion items are listed here:

Alberta White @whitesv: I loved this journal [article]! http://bul.sagepub.com/content/90/2/87 Teacher Leaders and collaboration are a must!

Annabel Bernard @bernara: The article review was a very interesting and eye-opening assignment. Had fun with this one :-)

Ariel Smith @ariel2: Bias, bias everywhere! Reading Ch. 8 has made me realize how hard it is to get a truly representative sample of a population.

Amy Willis @amywillis: Performance-base pay scales: How will the new performance-based teacher pay scale affect teachers? Positively? Negatively?

Assessment. Participants shared quick and constant feedback related to instructional materials such as PowerPoint, video clips, and selected articles as helpful or not helpful. In addition, participants also shared their assessment of information posted by other course participants. The selected samples of participants' tweets are as follows:

Angie Thomas @Mathis: Good power point on Qualitative research! I think that I understand it better.

Ariel Smith @ariel2: Impressed with my classmates after reading some of their article reviews. Specially intrigued by the idea of teacher leaders.

Alexandra Hensley @Hensley10: This video clarified the differences between quantitative and qualitative research and questions.

Aileen Linder @MissLinder: Things to do today: Research midterm and education quiz. I got this! :)

Allan Cunningham @Cunningh: I enjoyed the discussion question activity, it forces you to read, I'm going to try this with my 8th graders, because they are lazy
Annette Smith @smith3: The Chpt 2 power-point is very helpful. It gives a good overview of research process, I'm gonna save it so I can check back at the checklist

       Updates. Students by nature want to keep updated with each other. When a member updates his or her status, in any social network, it helps another individual understand what is going on. Course participants' updates were perceived as positive reinforcement. Any information related to course topic, reading assignment or expectation of the instruction would be helpful and may convey a powerful message to each other. Participants shared their updates in the following ways:

Angie Thomas @Mathis: I finally finished my literature review! Yea!
Ada Brown @brown77: Dr. ___is the bomb. Reflection 2 was submitted and graded within 10 minutes...Oh how I love this class
Adrienne Evans @abc28: http://www.youtube.com/watch?v=SwzfgNWmR6E ... Found this video a little while ago about John Elder Robison and Asperger syndrome. One day I hope to read his book.
Agnes Masters @masters: Interestingly enough, the researchers found that a principal's instructional practices do not affect student growth.
Retweeted by Amy Willis @Wills: Arne Duncan @arneduncan: New TEACH documentary airing tonight shows just how challenging and rewarding teaching can be: http://www.takepart.com/teach
Arthur Hobson @hobson: Just finished midterm exam. Anxious to see my grade. Assy Herr@sayherrgrn: Did mine yesterday. She grades pretty quickly. Hope you nailed it! I did :)
Alfreda Huskey @huskey: chapter 7 historical research is my favorite. I am a huge history fan and love reading research on history.
Agatha Long @Long10: The article I summarized was based on single sex genders in the classroom
Annabel Bernard @bernarjn: I just posted my questions under Group A. I hope to hear from my group soon!

IV. Discussion

       This study presented the perspectives of graduate students' (from Master of Education programs) experiences of using Twitter as a pedagogical tool for 15 weeks as a required social media activity in the class. Participants reported that they used Twitter for the first time. Participants also reported their positive experiences of engaging in class discussions, group projects, course announcements, and other required activities in their graduate online education programs.

       Participants acknowledged that Twitter fostered an active collaboration and student participation in continuing their educational activities (e.g., assignments, projects, and announcements) (McArthur & Bostedo-Conway, 2012). However, participants shared various personal reasons for why it was a challenge for them to use Twitter in the course- ranging from limited knowledge of Twitter to uninterested users who did not see its wider application in academia—whether in the K-12 settings or higher education. Researchers indicated that it is complex to define such academic pursuits and identities (Blair, 2013; Junco *at el*., 2011; Lin, Hoffman, & Borengasser, 2013). Twitter is beneficial to both professional and personal lives

(Lalonde, 2011), including educational domains (Hytten, 2010; Junco, Elavsky, & Heiberger, 2013).

The experiences of students and instructors varied while using Twitter in the regular and online Master of Education course. Participants not only reported challenges while using Twitter but also expressed an interest in future endeavors. However, the factors such as "age of students, number of students, and nature of classroom setting and technological knowledge of students can be some of the variables that the teacher has to consider while using Twitter in the classroom" (Bista, 2014, p. 145). Similarly, as Bista (2014) mentioned, the use of Twitter may not change the conventional academic literacy practices, but it certainly invites students to participate in the learning process. As Al-Khalifa (2010) mentioned, Twitter for this course became a virtual office where the researcher had a synchronous communication with the course participants. Overall, the findings from the current study suggest Twitter is a useful tool to enhance the social presence of students (Dunlap & Lowenthal, 2009).

V. Conclusion

This is one case study based on the perceptions of graduate students in education discipline where participants shared their experience of using Twitter as a required tool throughout a semester. The participants, professional graduate students working full time in the K-12 school settings, reported a variety of experiences—many of them did not realize Twitter was a learning tool worthy enough to implement in the graduate class; some of them found it challenging to follow up their tweets and information to posts owing to their busy schedule ; a few of them found Twitter helpful to engage with course materials; some of them even implemented Twitter in their personal and professional setting during the course; and many of them learned how to use Twitter and found their perceptions had positively changed.

Overall, participants in the current study reported positive experiences, saw Twitter as a valuable tool to use in the classroom, and recommended it to use in the future classes with clear instructions and expectations. Although there are clear debates between the educational rhetoric and the use of social spaces (e.g., Twitter, Facebook, and LinkedIn), the careful and creative use of such social media can strengthen the educational interest and academic success of students (Bista, 2014; McArthur & Bostedo-Conway, 2012). Twitter is rich in engaging students and teachers, and educators across the disciplines (Morgan, 2014).

This study may not be generalizable to a larger audience because the usage of Twitter was limited to a small sample size from one university class. Perceptions of graduate students (who were employed at the time of taking this online course) may vary if the participants were full time graduate students or students taking face to face classes. Only two course participants were familiar with Twitter before the course but the rest of the course members did not use twitter in their personal or professional lives. Participants might have different experiences if they were familiar with Twitter before the class started. In the context where there was not a clear social media policy in public schools in the United States, and these working participants naturally had a narrowed views of using Twitter in the class. Participants from another culture or geographical location might have different views and responses if this study would be replicated. The major limitation of the current study was data were collected from two small online classes and the online questionnaire and written responses from the course participants. The finding, therefore, does not generalize to students from a different program or setting.

Bista, K.

Although participants of this study indicated positive experiences of using Twitter, and recommended to use it in the future classes, this activity was required as outlined in the course. Participants had to participate in the activities in order to earn the points that counted towards their final course grade. The validity of the perceptions of course participants was not held against those who shared their experiences of Twitter use. This study heavily relied on the perceptions of the participants who shared their views in the course reflection essays as well as in the brief online survey. The grade expectations might or might not have influenced the opinions of the participants.

Twitter may be used differently in online teaching than in a traditional classroom setting. Some important elements such as the background of students (e.g., age, number of students), nature of the classroom setting, nature of course information and technological knowledge of students may be worth consideration while implementing Twitter in the classroom. It is hard to determine the facts about whether Twitter helps students build intellectual growth when used in the classroom or to develop a brand for marketing and other purposes. There are no definite answers about whether Twitter has been creating more social and educational opportunities for scholarly practice (Bista, 2014). However, Twitter is one of the emerging online spaces for social and educational participation and it needs future inquiry for other possibilities.

References

Al-Khalifa, H. S. (2010, May). Finding a place for Twitter in higher education. *eLearn*. Retrieved from http://elearnmag.acm.org/archive.cfm?aid=1821980

Antlfinger, C. (2014, January 24). Twitter gaining acceptance as a classroom tool. *The Washington Times*. Retrieved from http://www.washingtontimes.com/news/2014/jan/24/twitter-gaining-acceptance-as-a-classroom-tool/print/

Aspden, E. J., & Thorpe, L. P. (2009). Where do you learn? Tweeting to inform learning space development. *EDUCASE Quarterly, 32*(1). Retrieved from http://www.educause.edu/ero/article/where-do-you-learn-tweeting-inform-learning-space-development

Bart, M. (Ed.) (2011). *Social media usage trends among higher education faculty: Faculty focus special report*. Madison, WI: Magna Publications, Inc.

Bista, K. (2014). Twitter in higher education: New pedagogy in the knowledge era of globalization. In M. Limbu & B. Gurung (eds.), *Emerging pedagogies in the networked knowledge society* (pp. 195-205). Hershey, PA: IGI Global Publications. doi: 10.4018/978-1-4666-4757-2.ch010

Blair, A. (2013). Democratizing the learning process: The use of Twitter in the teaching of politics and international relations. *Politics, 33*(2), 135-145. doi: 10.1111/1467-9256.12008

Chichester, K. (2010, August 27). Cross-county collaboration: It all started with Twitter. *National Writing Project*. Retrieved from http://iditalis/nwp.org/resource/716

Creswell, J. W. (2012). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Dunlap, J. C., & Lowenthal, P. R. (2009). Tweeting the night away: Using Twitter to enhance social presence. *Journal of Information Systems Education, 20*(2), 129-135.

Ebner, M., Lienhardt, C., Rohs, M., & Meyer, I. (2010). Micro-blogs in higher education: A chance to facilitate informal and process-oriented learning. *Computers and Education, 55,* 92-100. doi: 10.1016/j.compedu.2009.12.006

Faculty Focus. (2009). *Twitter in higher education: Usage habits and trends of today's college faculty.* Madison, WI: Magna Publications, Inc.

Faculty Focus. (2010). *Twitter in higher education 2010: Usage habits and trends of today's college faculty.* Madison, WI: Magna Publications, Inc.

Galagan, P. (2010). Ready or not? *Training and Development, 64*(5), 29-31.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2), 87-105.

Gouseti, A. (2010). Web 2.0 and education. *Learning, Media and Technology, 35*(3), 351-356. doi: 10.1080/17439884.2010.509353

Grosseck, G., & Holotescu, C. (2008). Can we use Twitter for educational activities? *The 4th International Scientific Conference eLSE: eLearning and Software for Education.* Retrieved from http://adl.unap.ro/else/

Hytten, K. J. (2010). *Facebook's contribution to educationally purposeful activities and college student engagement* (unpublished doctoral dissertation). University of Vermont, Burlington.

Johnson, R. B., & Christensen, L. (2014*). Educational research: Quantitative, qualitative, and mixed approaches* (5th ed.). Thousand Oaks, CA: Sage.

Junco, R., Elavsky, M., & Heiberger, G. (2013). Putting Twitter to the test: Assessing outcomes for student collaboration, engagement and success. *British Journal of Educational Technology, 44*(2), 273-287. doi: 10.1111/j.1467-8535.2012.01284.x

Junco, R., Heiberger, G., & Loken, E. (2011). The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning, 27*(2), 119-132. doi: 10.111/j.1365-2729.2010.00387.x

Kirschner P. & Karpinski A. (2010) Facebook and academic performance. *Computers in Human Behavior 26*, 1237– 1245. doi: 10.1016/j.chb.2010.03.024

Lalonde, C. (2011). *The Twitter experience: The role of the Twitter in the formation and maintenance of personal learning network* (Master's thesis). Royal Roads University, Canada.

Lang, J. M. (2013). How Orwell and Twitter revitalized my course. *The Chronicle of Higher Education*. Retrieved from https://chronicle.com/article/How-OrwellTwitter/142617/

Lin, M. F., Hoffman, E. S., Borengasser, C. (2013). Is social media too social for class? A case study of Twitter use. *TechTrends, 57*(2), 39-48.

Luttrell, R. (2012). *Social networking sites in the public relations classroom: A mixed methods analysis of undergraduate learning outcomes using wordpress, facebook, and twitter* (unpublished doctoral dissertation). California Institute of Integral Studies, San Francisco, CA. UMI No. 3539719

Malesky L. A., & Peters C. (2013). Defining appropriate professional behavior for faculty and university students on social networking websites. *Higher Education*, *63*(1). doi: 10.1007/s10734-011-9451-x.

McArthur, J. A., & Bostedo-Conway, K. (2012). Exploring the relationship between student-instructor interaction on Twitter and student perception of teacher behaviors. *International Journal of Teaching and Learning in Higher Education, 24*(3), 286-292.

Matteson, A. (2010). Tweacher: The Twitter enhanced teacher. *School Library Monthly, 27*(1), 22-23.

Mertens, D. M. (2015). *Research and evaluation in education and psychology* (4th ed.). Thousand Oaks, CA: Sage.

Morgan, H. (2014). Focus on technology: Enhancing instruction and communication with Twitter. *Childhood Education, 90*(1), 75-76. doi: 10.1080/00094056.2014.872522

Priego, E. (2011, Sept. 11). How Twitter will revolutionize academic research and teaching. *The Guardian*. Retrieved from http://www.guardian.co.uk/higher-education-network/blog/2011/sep/12/twitter-revolutionise-academia-research

Rockingson-Szapkiw, A. J., & Szapkiw, M. (2011). Engaging higher education students using Twitter. *Proceedings of Global Learn Asia Pacific,* 360-364. Retrieved from http://works.bepress.com/amanda_rockinson_szapkiw/31/

Salter, A. (2012 October 8). Presenting for Twitter at conferences. *The Chronicle of Higher Education.* Retrieved from http://chronicle.com/blogs/profhacker/presenting-for-twitter-at-conference/43176

Schreier, M. (2012). *Qualitative content analysis in practice*. Thousand Oaks, CA: Sage.

Springer, T. J. (2014). UD faculty use Twitter to enhance classroom experience. Retrieved from http://www.udel.edu/udaily/2014/nov/tech-classroom-twitter-111913.html 1/

Veletsianos, G. (2012). Higher education scholars' participation and practices on Twitter. *Journal of Computer Assisted Learning, 28*, 336-349. doi:10.111/j.1365-2729.2011.00449.x

Vooren, C. V., & Bess, C. (2013). Teacher tweets improve achievement for eight grade science students. *Systemic, Cybernetics, and Informatics, 2*(1), 33-36.

Yuan, H. (2012). *Applying Twitter to EFL reading and writing in a Taiwanese college setting* (Doctoral dissertation). Indiana State University, Indiana.

Yin, R. K. (2013). *Case study research: Design and method*s (5th ed.). Thousand Oaks, CA: Sage.

Mission

Founded in 2001, the Journal of the Scholarship of Teaching and Learning (JoSoTL) is a forum for the dissemination of the Scholarship of Teaching and Learning in higher education for the community of teacher-scholars. Our peer reviewed Journal promotes SoTL investigations that are theory-based and supported by evidence. JoSoTL's objective is to publish articles that promote effective practices in teaching and learning and add to the knowledge base.

The themes of the Journal reflect the breadth of interest in the pedagogy forum. The themes of articles include:

1. Data-driven studies: formal research projects with appropriate statistical analysis, formal hypotheses and their testing, etc. These studies are either with a quantitative or qualitative emphasis and authors should indicate the appropriate domain. Acceptable articles establish a research rigor that leads to significant new understanding in pedagogy.

2. Reflective essays: integrative evaluations of other work, essays that challenge current practice and encourage experimentation, novel conclusions or perspectives derived from prior work

3. Reviews: Literature reviews illuminating new relationships and understanding, meta-analysis, analytical and integrated reviews, etc.

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Style Sheet for the
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John Dewey[1] **and Marie Curie**[2]

Abstract: This paper provides the style sheet for the Journal of the Scholarship of Teaching and Learning. Manuscripts submitted for publication should adhere to these guidelines.

Keywords: radiation, metacognition, identity theory, constructivism, educational philosophy.

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Indent the first line of every paragraph and the first line of every footnote; all first line indentations should be 0.5". Use only one space after the period of a sentence (word processors automatically adjust for the additional character spacing between sentences). The keywords should be formatted identically to the abstract with one line space between the abstract and the keywords. Authors should use keywords that are helpful in the description of their articles. Common words found in the journal name or their title article are not helpful keywords.

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[1]Department of Educational Philosophy, Indiana University Northwest, 3400 Broadway, Gary, IN 46408, jdewey@iun.edu.
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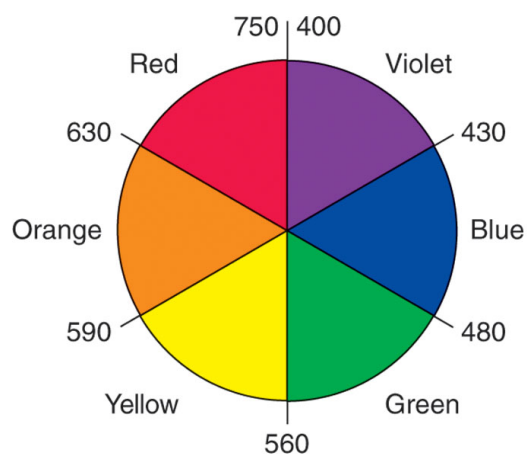
750 | 400

Red   Violet

630   430

Orange   Blue

590   480

Yellow   Green

560

Figure 1. Color wheel with wavelengths indicated in millimicrons. Opposite colors are complementary.

Acknowledgements

Acknowledgements should identify grants or other financial support for this research by agency (source) and number (if appropriate). You may also acknowledge colleagues that have played a significant role in this research.

Appendix

Please insert any appendices after the acknowledgments. If your submission has only one appendix, this section should be labeled '*Appendix.*' More than one appendix will change the section label to '*Appendices.*' Each appendix should have a title; if you are including items from your class or research, please alter them to include a title. Appendices should be alpha-order (Appendix A, Appendix B, etc.) These labels and titles should be at the top of the page, left justified, italicized.

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References

Coffin, D. A. (1993). Using the competitive edge. *Journal of Economic Education*, *24*(1), 62-69.

Garcia, J., & Rodriguez, P. (2002). The determinants of football match attendance revisited: Empirical evidence from the Spanish football league. *Journal of Sports Economics*, *3*(1), 18-38. doi: 10.1177/152700250200300103

Hamilton, S. J. (1995). *My name's not Susie: A life transformed by literacy*. Portsmouth, NH: Boynton/Cook Publishers.

Pappas, D. (2004). Fixing the fan cost index: A more realistic view. Retrieved from http://www.baseballprospectus.com/article.php?articleid=2790.