TOJNED
THE ONLINE JOURNAL
OF NEW HORIZONS IN EDUCATION

ISSN: 2146-7374

The Online Journal of New Horizons in Education

Volume 7 Issue 2
April 2017

www.tojned.net
April 2017

Contact Address:
Prof. Dr. Aytekin İŞMAN
TOJNED, Editor in Chief
Sakarya-Turkey

Published in TURKEY

Message from the Editor-in-Chief

TOJNED welcomes you.

I am happy to inform you that The Online Journal of New Horizons in Education (TOJNED) has been published volume 7 issue 2 in 2017. This issue has research papers from all around the world.

The Online Journal of New Horizons in Education (TOJNED) is an international journal in the field of education. TOJNED is an online and peer-reviewed journal that accepts papers on all aspects of education. Research papers could be about, but are not limited to: teacher education, education science, science education, social science education, new developments in education, instructional design, curriculum, and others related topics.

The aim of TOJNED is to diffuse new developments in education. The mission of TOJNED is to provide educators, teachers, administrators, parents and faculties with knowledge about the very best research in education. TOJNED's acceptance rate is almost 38%. TOJNED is now a major resource for knowledge about education.

TOJNED publishes research and scholarly papers in the fields of education. All papers are reviewed at least by two international members of the Editorial Board with expertise in the areas(s) represented by a paper, and/or invited reviewers with special competence in the area(s) covered. The Editors reserve the right to make minor alterations to all papers that are accepted for publication.

TOJNED is interested in various researches in education. These researches can help teachers to find out how educational activities can motivate and help students to put the knowledge to their long term memory. Therefore, I am pleased to publish this issue which different papers from various fields are shared with professionals.

TOJNED thanks and appreciate the editorial board members who have acted as reviewers for one or more submissions of this issue for their valuable contributions.

TOJNED is confident that readers will learn and get different aspects on education. Any views expressed in this publication are the views of the authors and are not the views of the Editor and TOJNED.

TOJNED will organize INTE - 2017 at Freie University in Berlin, Germany. INTE series is an international educational activity for academics, teachers and educators. This conference is now a well-known educational science event. It promotes the development and dissemination of theoretical knowledge, conceptual research, and professional knowledge through conference activities. Its focus is to create and disseminate knowledge about educational science.

Call for Papers
TOJNED invites our authors to submit a research paper. Submitted articles should be about all aspects of educational science. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJNED. Manuscripts must be submitted in English.

TOJNED is guided by its' editors, guest editors and advisory boards. If you are interested in contributing to TOJNED as an author, guest editor or reviewer, please send your CV to tojned@gmail.com.

April 01, 2017
Editor-in-Chief
Prof. Dr. Aytekin İŞMAN - Sakarya University, Turkey

Table Of Contents

A COMPARISON OF SOUTH AFRICA GRADE 11 LEARNERS' AND PRE-SERVICE TEACHERS' UNDERSTANDINGS OF NATURE OF SCIENCE

Elaosi Vhurumuku[1] and Washington T. Dudu
[1]Marang Centre for Science and Mathematics Education, University of Witwatersrand, School of Education,
P.O. Box 488, Wits 2050, Johannesburg,South Africa,
E-mail: elaosi.vhurumuku@wits.ac.za Fax: 086 529 6753

ABSTRACT
This paper reports the results of a study that compared South Africa Grade 11 learners (n=10) and third year B.Ed. Pre-service teachers' (n=10) understandings of Nature of Science (NOS) as part of their Physical Science subject matter knowledge. Data on the learners' and pre-service teachers' NOS understandings was quantitatively and qualitatively collected using a Likert type questionnaire and interviews respectively. Quantitative analysis of the data is done using the Mann-Whitney U test and graphical comparison of median scores of Likert questionnaire items to ascertain differences in NOS understandings between the Grade 11 learners and the B.Ed. Pre-service teachers. A combination of typological and interpretative analysis of interview transcripts is done to determine differences in NOS understandings between learners and Pre-service teachers.The analyses reveal that overall, the Learners and B.Ed. Pre-service teachers' understandings of NOS are not very different from each other. It is recommended that if the goal of science education for scientific literacy is to be achieved, initial teacher education training should do more to explicitly develop pre-service teachers' subject matter knowledge understandings, pedagogical skills and valuing of NOS, that is, their pedagogical content knowledge for nature of science. Explicit testing of learners' NOS understandings is suggested as a way of improving the school Physical Science curriculum.
Keywords: nature of science, learners, pre-service teachers, comparison

INTRODUCTION

Most science education reforms worldwide advocate for the development of teachers and learners' understandings of nature of science (NOS), as an important goal of science education (see for example, NRC, 1996; Achieve Inc., 2013; AAAS, 1993; Lederman, 1992, 2007). Nature of Science is a complex and multi-faceted concept which has been controversial in the science education community for more than half a century now. It has been perceived differently by scientists, philosophers, teachers and researchers resulting in the absence of an agreed universal definition of the concept (Lederman, 1992; Abd-El-Khalick and Lederman, 2000; Schwartz, Lederman and Lederman, 2008). However for this paper we broadly define NOS understandings as comprising the views, perceptions, ideas and beliefs held by an individual about both the nature of scientific knowledge and the processes of its development and validation **(**Vhurumuku and Mokeleche**,** 2009**)**. Our definition of NOS science therefore encompasses the individual's understanding of both the nature of scientific knowledge (NOSK) and nature of scientific inquiry (NOSI). Scientific knowledge refers to the ideas, facts, principles, laws and theories making the body of knowledge called science (Bartos and Lederman, 2014). By scientific inquiry we mean the processes through which scientific knowledge is developed, validated and accepted (Achieve, Inc., 2013). These processes include problem and hypothesis formulation as well as the gathering of data using the senses and experiments and the communication of empirical findings.

Whichever way one looks at the construct NOS, there appears to be consensus that in order for teachers to teach learners effectively about NOS they themselves must have acceptable cognitive and epistemic understandings of the construct (Vhurumuku, 2015). Our contention is that NOS understandings are part of pedagogical content knowledge (PCK) as has been proposed by several researchers (for example, Irez and Cakir, 2006; Ratcliffe, 2008; Schwartz and Lederman, 2002). We also are of the view that teachers can only teach about NOS if they themselves also understand NOS. In South Africa the new Further Education and Training (FET) phase Grade 12 Physical Science curriculum, requires that learners' understandings of NOS be developed in order for them attain a reasonable degree of scientific literacy (Department of Education, 2011). While this is so, copious research, by the government and academics, indicates worrying numbers of new teachers who are poorly prepared to teach (Mail and Guardian, April 17, 2015) partly because of poor subject content mastery including knowledge about NOS.

In South Africa, the development of learners and student teachers understandings of NOS is an important science education goal. An understanding of NOS is part of citizens' scientific literacy. Scientifically literate citizens can contribute meaningfully to any country's socio-economic development through for example, participating in debates of socio-scientific issues (Kolsto, 2001). From an educational perspective it is important to determine the

ways in which would be teachers and learners' understandings of NOS are different from each other so as to inform both initial teacher education and curriculum development and implementation at the secondary school level. The focus of this study therefore was to compare the NOS understandings of student teachers at a South African university enrolled in a B.Ed. Programme, with those of Grade 11 learners studying the new Science CAPS curriculum in South Africa. In South Africa, the recently revised science curriculum documents encourage promotion of learner understanding of NOS (DoE, 2011). There is an underlying assumption that teachers should have more developed understandings of the science subject matter including NOS, compared to the learners they are supposed to teach. Abd-El-Khalick and Lederman (2000) argue that teachers' understandings of NOS should be addressed first if there is any hope of developing adequate understandings of the learners. Coleman, Stears and Dempster (2015) allude to the fact that South African learners are taught by teachers who themselves often do not have an adequate understanding of NOS. They also suggest that teachers who lack basic understanding of NOS knowledge might present science subject matter in manners which leave room for learner misinterpretations and misconceptions. The purpose of this study therefore was to compare the NOS understandings of Grade 11 learners and third year Science Pre-service student teachers enrolled in a B.Ed. Programme.

The critical question the research sought to answer was: How do the NOS understandings of Grade 11 learners' compare with those of third year Physical Science Pre-service student teachers enrolled in a B.Ed. Programme?

METHODOLOGY

This research is located within both the quantitative and qualitative frameworks. To obtain quantitative data on Grade 11 learners and Pre-service teachers understandings of NOS, a Likert type questionnaire consisting of 20 items adopted from the Beliefs About Science and School Science (BASSSQ) instrument developed by Aldridge, Taylor and Chen (1997) was administered to 10 conveniently sampled Grade 11 Physical Science learners at a school outside Johannesburg, South Africa and 10 conveniently sampled third year Physical Science student teachers enrolled for a B.Ed. Programme at a university in central Johannesburg, South Africa. Qualitative data was obtained from interviewing each of the 10 Grade 11 Physical Science learners and each of the 10 third year Physical Science student teachers enrolled for the B.Ed. Programme. Semi-structured interview questions were selected items from the Views of Nature of Science- Form C (VNOS-C) instrument of Abd-El-Khalick (1998) and Views about Scientific Inquiry questionnaire (VASI) by Lederman et.al. (2014). Three aspects of NOSK and two aspects of NOSI were assessed in this interview following the administration of the BASSSQ. All interviews were audiotaped and transcribed verbatim.

Grade 11 learners and Pre-service Teacher Participants

Ten Grade 11 Physical sciences learners were conviniently selected from the School outside Johanneburg based on perfomance in Physical Science and willingness to participate. Of the 10 learners, 4 are males and 6 are females. The learners ages ranged from 16 to 18. Of the 10 learners 1 is white, 2 are Indians and the rest are blacks. English is the first language for 3 participants and the second or third for the other seven 7 participants. All the learners come from good socio-economic backgrounds and have access to many learning resources such as libraries, internet, textbooks and tablets. The ten conviniently sampled Pre-service teachers were third year students studying full time for a Bachelor in Education training to be specialist Physical Science (Physics and Chemistry) teachers. Six are males and 4 are females. Two of the Pre-service teachers are English first language speakers. The Pre-service teachers had done a number of courses in Physical Sciences and Science Teaching Methods courses in the last two years. They had all five three week teaching experiences periods prior to their participation in the study. All of them were over 18 years old and had done very well in all their courses in their first and second years at university.

DATA ANALYSİS

Quantitative analysis

First, the Mann-Whitney U test was employed on the BASSSQ data to ascertain whether there was a difference in the understandings of the two groups. The hypotheses tested were as follows:

H0: There is no difference in the understandings of NOS of Grade 11 learners and Pre-service teachers.
H1: There is a difference in the understandings of NOS of Grade 11 learners and Pre-service teachers

Secondly, responses to the 20 BASSSQ items were assessed. Ten of the items have to with understanding of NOSK and ten understanding of NOSI. The items were scored using a Likert scale. The responses most congruent with acceptable NOS understandings received a score of 5, and the responses least congruent with NOS understandings received a score of 1. Thus, the possible range of total scores was 20 - 100. Thirdly, the group median score on each of the 20 items was computed and recorded using EXCEL Programme 2010

Version. These scores were used to make a graphical comparison.

Qualitative analysis
Qualitatively learner and Pre-service teacher interview data were analysed through a combination of typological analysis (Hatch, 2002) and interpretive analysis Denzin and Lincoln (2002) using predetermined categories of naïve or informed understandings as done by Abd-El-Khalick and Lederman (2000). Responses were read and re-read and categorised as naive or informed. Some illustrative responses then selected for data presentation with meanings attached to the data.

RESULTS
Quantitative Results
To test the null hypothesis, the Mann-Whitney U test was performed for a two tailed test with significance level set at .05. Median latencies in Grade 11 learner and Preservice teachers were 39 and 41 respectively; the distributions in the two groups did not differ significantly (Mann–Whitney $U = 113$, $n1 = n2 = 10$, $P < 0.05$ two-tailed). This led to failure to reject the null hypothesis, that there is no difference in the understandings of NOS of Grade 11 learners and Pre-service teachers. This result is further corroborated when a plot of a comparison of median scores for each item on the BASSSQ is done as shown in Figure 1. Figure 1 shows that there was not much difference in the performances of the two groups on each item. Thus overall, the Mann–Whitney *U test* and the graph show that Grade 11 learners and Pre-service teachers' understandings based on the *BASSSQ* were not very different from each other.

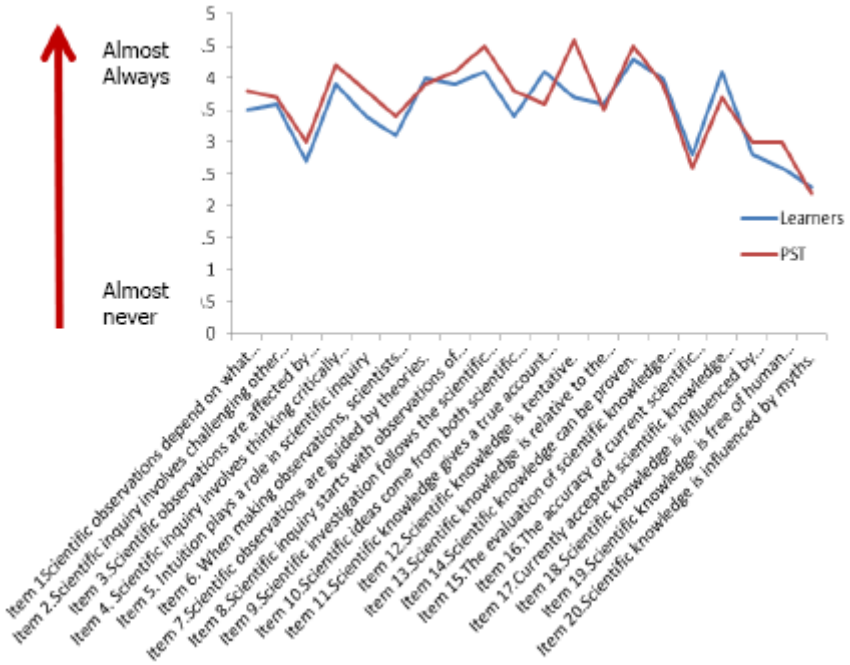


Figure 1: Comparison of median scores for each item on the BASSSQ (n=10)

Qualitative Results
Analysis of interview responses shows that on most of the NOS aspects assessed in the Grade 11 learners and third year Pre-service teachers have more or less similar understandings of NOS. For example, exploring the two groups' understanding of the NOS aspect scientific method resulted in the following respective responses:

PST 7*: If scientists do not follow a set of steps or method that is standard, then we risk not being able to replicate the experiment. This then makes the experiment unreliable. However, I do believe that you do not always need to follow the steps in a set order.*

Learner 3: *All scientists use the scientific method. The scientific method covers all the aspects of an investigation. It helps plan out the procedure and information of the experiment and allows scientists to understand the outcome of their experiments with clear conclusion.*

PST 7 and Learner 3 both held naïve perceptions about the scientific method and there was no difference in their

understanding of that NOS aspect.
Furthermore, when the two groups were assessed on their understanding of another NOS aspect, the social and cultural embeddedness of scientific knowledge their responses were not very different from each other. Clearly, both groups exhibited mixed and naïve responses. The extracts below are illustrative:

PST 5: *I believe science is universal. This is because the same data will be gathered if the same method is used anywhere in the world.*

Learner 4: *Science is universal due to the fact that it is not based around subjective or biased decision making, for example the Big Bang theory. Everything is factual and can be understood in global measures.*

Learner 4 and PST 5 misinterpreted the NOS aspect and asserted that science is universal (mixed view) and then went on with their explanations which were misconceptions. From these
responses, one could clearly see that there was no difference in understanding of this NOS aspect between the two participants from the two groups.
The interview results also showed that both the Grade 11 learners and the Pre-service teachers held informed views on the tentativeness of scientific knowledge. Both groups' interviewees demonstrated their appreciation and acknowledgement that scientific views and ideas have changed overtime by saying the following;

PST 7: *Yes. More information about a specific theory could be found thus changing the original idea or concept of the theory due to recent discoveries.*

Learner 3: *Scientific knowledge is always changing. As a result, new discoveries are constantly made and these discoveries may contribute to a scientific theory being changed.*

Learner 3 clearly asserts that scientific knowledge is dynamic while PST 7 affirms by saying that "Yes" scientific knowledge changes overtime due to new discoveries. It is evident that there was no difference in the understanding of the tentativeness of scientific knowledge between the two groups. Both groups showed a relatively good understanding of this NOS aspect.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

The findings from this study indicate that there is little or no difference in understanding the NOS between high school learners and Pre-service teachers. It was expected that Pre-service teachers would show a significantly better understanding compared to the Grade 11 learners. These findings suggest that there is no clear development in NOS understanding as learners' progress from high school to university. This concurs with Palmquist and Finley (1997) who suggest that most pre-service teachers enter the teaching programmes at university and tightly cling to their mixed and naïve views of the NOS. This is despite the fact that at university, they are expected to do science education courses which emphasize the inclusion of the NOS in their science instruction (Mathews, 1998; Ogunniyi, 1983). The findings support McCommas's (1998) assertion that NOS is not very much emphasized in science lessons in schools. The lack of any differences in the understandings of the NOS between the Grade 11 learners and the Pre-service teachers hence becomes completely surprising because of the differences in which NOS instruction is treated and emphasized at their respective different science education levels. These findings suggest that more should be done by the university to explicitly develop pre-service teacher understandings of NOS if the goal of science education for scientific literacy is to be achieved**.** Abd-El-Khalick and Lederman (2000) argue that teachers' pedagogical content for NOS should be addressed first if there is any hope of developing adequate understandings of the learners. Additionally, it might be necessary to include assessment of learners NOS understandings as part of school examinations. Perhaps that way both learners and teachers can begin to value NOS. This study's findings point towards the need to pay attention to ways in which NOS is represented and addressed in both the school curricula and the science education teacher programs in South Africa.

REFERENCES

Abd-El-Khalick, F. (1998). The influence of history of science courses on students' conceptions of nature of science. Unpublished doctoral dissertation. Oregon State University, Corvallis.

Abd-El-Khalick, F., & Lederman, N. G. (2000). The influence of history of science courses on students' views of nature of science. *Journal of Research in Science Teaching, 37*(10), 1057-1095.

Achieve, Inc., on behalf of the twenty-six states and partners that collaborated on the NGSS (2013). Next generation science standards. Retrieved June 20, 2015 from http://www.nextgenscience.org/nextgeneration-science-standards.

Aldridge, J., Taylor, P., & Chen, C. (1997). *Development, validation and use of the Beliefs about Science and*

School Science Questionnaire. Paper presented at the Annual meeting of the National Association for Research in Science Teaching, Chicago.
American Association for the Advancement of Science. (1993). *Project 2061. Benchmarks for Science Literacy*. Washington, DC: American Association for the Advancement of Science.
Bartos, S.A. & Lederman, N.G. (2014). Teachers' knowledge structures for nature of science and scientific inquiry: Conceptions and classroom practice. *Journal of Research in Science Teaching*, 51 (9), 1150-1184.
Coleman, J., Stears, M., & Dempster, E. (2015). Student teachers' understanding and acceptance of evolution and the nature of science. *South African Journal of Education*, 35 (2) 1-9.
Denzin, N. K., & Lincoln, Y. S. (2003). Introduction: The discipline and practice of Qualitative research. In N.K. Denzin & Y.S. Lincoln (Eds.), *Handbook of qualitativ*e Research (pp1-29). 2nd Edition, Thousand Oaks, CA: Sage.
Department of Education. (2011). *Curriculum and Assessment Policy Statement (CAPS) Physical Sciences*. Pretoria: Government Printers.
Hatch, J. A. (2002). *Doing qualitative research in education settings*. New York: SUNY.
Irez, S., & Cakir, M. (2006). Critical reflective approach to teach the nature of science: A rationale and review of strategies. *Journal of Turkish Science Education*, 3(2), 7-23.
Kolsto, S.D. (2001). Scientific literacy for citizenship: tools for dealing with the science dimension of controversial socio-scientific issues. *Science Education,* 85(3), 291-310.
Lederman, N. G. (1992). Students' and teachers' conceptions of the nature of science: A review of the research *Journal of Research in Science Teaching, 29*(4), 331-359.
Lederman, N. G. (2007). Nature of Science: Past, Present, and Future. In S. K. Abell & N. G. Lederman (Eds.), *Handbook of Research on Science Education* Mahwah, New Jersey: Lawrence Erlbaum Associates
Lederman, J.S., Lederman, N.G., Bartos, S.A., Bartels, S.L., Meyer, A.A. & Schwartz, R.S. (2014). Meaningful assessment of learners' understandings about scientific inquiry-The views about scientific inquiry (VASI) questionnaire. *Journal of Research in Science Teaching, 51*(1), 65-83.
Mail and Guardian. Most of our teachers can't. April 17, 2015.
Matthews, M. R. (1998). The nature of science and science teaching. In B. J. Fraser & K. Tobin (Eds.), *International handbook of science education* (pp. 981-999). Dordrecht, The Netherlands: Kluwer.
McComas, W., .F. (1998). The principal elements of the nature of science: Dispelling the myths. In W. F. McComas (Ed.), *The Nature of Science in Science Education: Rationales and Strategies*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
National Research Council. (1996). National Science Education Standards. Washington, DC: National Academic Press.
Ogunniyi, M. B. (1983). An analysis of laboratory activities in selected Nigerian secondary schools. *European Journal of Science Education,* 5 (2) 195-201.
Palmquist, B.C., and Finely, F.N. (1997). Pre-service teachers' views of the nature of science during a post baccalaureate science teaching programme. *Journal of Research in Science Teaching*, 34(6), 595-615.
Ratcliffe, M. (2008). *Pedagogical content knowledge for teaching concepts of the nature of science.* Paper presented at 9th Nordic Research Symposium on Science Education. June 2008, Reykjavik: Iceland.
Schwartz, R. S., Lederman, N. G., & Lederman, J. S. (2008, March 30-April 2). *An Instrument to Assess Views of Scientific Inquiry: The VOSI Questionnaire.* Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Baltimore, MD.
Schwartz, R.S. & Lederman, N.G. (2002). "It's the nature of the beast". The influence of knowledge and intentions on learning and teaching nature of science. *Journal of Research in science teaching*, 39 (3), 205-236.
Vhurumuku, E., & Mokeleche, M. (2009). The nature of science and indigenous knowledge systems in South Africa, 2000-2007; a critical review of the research in science education. *African Journal of Research in Mathematics, Science and Technology, Special Issue, 1*, 96-114.
Vhurumuku, E. (2015). Pre-service Teachers' Beliefs about Scientific Inquiry and Classroom Practices. *International Journal of Educational Sciences*, 10 (2), 280-296

A PROPOSAL TO USE CLASSROOM OBSERVATIONS AS ASSESSMENT DATA TO MEASURE AND EVALUATE EFFECTIVE TEACHING

Jace Hargis, Ph.D.
Director, Center for Teaching and Learning, University of California, San Diego
La Jolla, CA 92093 USA
jace.hargis@gmail.com

Melissa Soto, Ph.D
Assistant Professor
San Diego State University, San Diego, CA 92182 USA
melissoto@gmail.com

ABSTRACT
Effective teaching has historically been evaluated by using student perception surveys. This paper proposes a method to supplement the student surveys. The method would empower faculty to gather additional assessment data aligned with effective teaching and subsequently provide them with measurement tools to self-evaluate their effective teaching. For the theoretical framework, we integrate the three major stages of assessment; measurement; and evaluation. The assessment stage addresses three further steps, which include a/n pre-observation; observation; and post-observation. Within the observation step, there is also three parts, a quantitative checklist; qualitative field narrative; and faculty flow diagram. In the measurement stage, an analytical rubric has been created and proposed to assist faculty in measuring their assessment data and enable a more complete final evaluation step. The ultimate goal is to provide faculty with the ability to gather broader representations of their teaching, which will enable them to monitor, update and continuously improve their personalized teaching philosophy.
Keywords: Effective Teaching, Student Perception Survey, Observations, Assessment, Measurement, Evaluation

INTRODUCTION

In nearly all U.S. university classrooms, student evaluations, or more accurately, student perception surveys, are used to evaluate teaching effectiveness (Murray, 2005). This study addresses effective teaching by recommending the collection of additional data, to supplement student perception data. The intent of the new process is to help provide a more holistic and therefore accurate representation of the teaching and learning experience through the well-established process of assessment, measurement and evaluation. First, it is critical to operationally define these three key terms, used as the foundation of this study:

1. **Assessment** is a process of gathering information from multiple and diverse sources to understand learner knowledge, skills and dispositions (Huba & Freed, 2000).
2. **Measurement** is an assignment of marks based on an explicit set of criteria (rubrics) (Sadler, 2005).
3. **Evaluation** is the process of making judgments on the level of performance - based on assessment and the set of criteria (Macquarie University Learning & Teaching Centre, 2010).

All three of these concepts are necessary to create an accurate account of teaching and learning effectiveness. Therefore, this study will recommend three distinctive steps, which will allow the efficient collection of this data and empower faculty to receive personal data on the methods and approaches they offer in their classrooms. Subsequently, faculty are provided guides to assist them in interpreting and reflecting on the data to create their own evaluation, teaching philosophy/statement and action steps for continuous improvement.

Author (2014) described an observation process in which he used a teaching attribute instrument, modified from Chism (1999); qualitative notes of behaviors; and a faculty flow diagram. Author (2014) observed one hundred and ninety-six faculty members from three different institutions in two countries over a ten-year period. Faculty came from many different disciplines including the arts, sciences, engineering, information technology, business, law, education, nursing, pharmacy, physical therapy and dentistry disciplines. The purpose of this current study is to describe how observations can be integrated into a larger evaluation process and to illustrate how this process has been scaled to include larger classroom settings and a more diverse student population. In this study, data is incorporated from two universities (a small private liberal arts and a large research intensive), which adds 40 faculty members (for a total of 236 faculty) and 3,165 students to the original data set.

LITERATURE REVIEW

Effective Teaching

There are several interpretations of effective teaching. Through a fifteen-year study of nearly one hundred college teachers in a wide variety of fields and universities, Ken Bain (2004) summarizes effective teaching attributes in his book entitled, "What the Best College Teachers Do." The result of Bain's research shows that effective teachers know how we learn, process information and make conceptual connections; teach as serious intellectual endeavor; assess their own efforts and make continuous adjustments; create an environment where diverse learners explore, analyze, synthesize and construct meaning for themselves; and integrate the Scholarship of Teaching and Learning (SoTL) as an essential contribution of effective teaching.

Furthermore, Bain (2004) connects effective teaching attributes to research. Effective learning is supported when students are actively engaged in the learning process (Chickering & Gamson, 1987). This can be accomplished by creating a climate of inquiry where students feel appropriately challenged and activities are linked to research and scholarship (Jenkins, Blackman, Lindsay, & Paton-Salzberg, 1998) and students' experiences are acknowledged, valued, and drawn on in learning and teaching approaches (Bransford, Brown, & Cocking, 1999; Humphreys, 1998). Another important aspect of effective teaching is providing students with ample opportunities to engage in formative assessments. These include structured occasions for students to reflect on their experiences to challenge current beliefs and develop new practices and understandings (Gibbs, 1981), as well as reflect on and implement meaningful and timely feedback (Isaacs, 2001). When students are encouraged to take responsibility for their own learning, they are more likely to develop higher-order thinking skills such as analysis, synthesis, and evaluation (Zimmerman, 1998). Effective teaching can also be enhanced when students become part of a community of learners in which they can draw on each others' ideas. If dialogue is encouraged between students and teachers and among students, student motivation and engagement can be increased, thus creating a community of learners (Stefanou & Salisbury-Glennon, 2002). Ultimately, instructors must clearly articulate course expectations, goals, learning outcomes, and requirements to increase student motivation and improve learning (Race, 2001). By integrating all of these aspects, effective learning is facilitated and support the achievement of desired learning outcomes (Biggs, 2002).

Student Perception Surveys

There are numerous studies which have shown the inadequacies of student perceptions on effective teaching and learning (Benton & Cashin, 2012; Carrell, & West, 2010; Clayson, 2009). A recent meta-study by Uttl, White, and Gonzalez (2016) found zero correlation between student evaluations and learning. The authors suggest that institutions focused on student learning and career success may want to abandon student evaluation ratings as a measure of faculty's teaching effectiveness. Stark (2016) also found strong evidence that student responses to questions of effectiveness do not measure teaching effectiveness. Stark's recommendation is that "the common practice of relying on averages of student teaching evaluation scores as the primary measure of teaching effectiveness for promotion and tenure decisions should be abandoned for substantive and statistical reasons (p. 2)."

Additional studies have been conducted to specifically identify biases in student perception data. A variable explored by Walsh, Millar, and Westfall, (2016) was the "attractiveness" of a professor. The authors asked 131 randomly assigned college students to listen to a recording of a 20-minute physics lecture. While the lecture was playing, a computer displayed an attractive person in some cases and not attractive in others. Using a 25-item quiz, there was a statistically significant difference in favor of the students viewing the attractive instructor. In addition, Boring, Ottoboni, and Stark (2016) recently found that student evaluations of teaching are biased against female instructors by an amount that is statistically significant; the bias varied by discipline and by student gender; and biases could be large enough to cause more effective instructors to get lower evaluations than less effective instructors. Effective evaluation requires reliable and valid data collection instruments and well aligned outcomes from which to be assessed and measured. Student perceptions of faculty performance are very important, however, that data alone is insufficient to describe the full extent of effective teaching.

Assessment (Observations), Measurement and Evaluation

Although every university teaches students the importance of assessment, measurement and evaluation, ironically, using these critical attributes to evaluate our own teaching effectiveness is often overlooked. Using multiple assessments and measures is essential to determining an accurate evaluation of the instructor (Goe & Croft, 2009). In addition, the lack of complete assessment data fails to recognize the wide range of ways in which teachers contribute to student learning. In our study we operationally define assessment as a process of gathering information from multiple and diverse sources to understand learner knowledge, skills and dispositions (Huba & Freed, 2000). The primary method for gathering information is through classroom observations and the diverse sources are through quantitative, qualitative and graphical representations (Author, 2014). Danielson and

McGreal (2000) cite multiple assessments, such as reflection; collaboration; self-directed inquiry; and participation in a community of learners as assessment data to measure and use for subsequent evaluation.

Measurement is an assignment of marks based on an explicit set of criteria (Sadler, 2005). A common approach to measuring assessment data is to create a set of criteria that align with key aspects of the intended goals and outcomes. To accomplish this approach of measurement, an analytical rubric is often used. There are many types of rubrics which can provide a clear set of criteria associated with various levels of success, with gradations of points or quality descriptive terms (Hargis, Cavanaugh, Kamali, & Soto, 2014). Rubrics create a clear bridge between the outcome and assessment (Sebastiá, et al, 2011). They define the criteria, especially with processes or abstract, qualitative concepts. Rubrics are objective, consistent and an inter-rater reliability coefficient can be generated, which determines the rigor. Rubrics are measurement instruments that articulates the expectations for an artifact by stating the criteria and describing levels of quality (Maki, 2012). Rubrics can be a useful way to communicating expectations, and providing focused feedback on works in progress (Brown, Race, & Smith, 2005). Rubrics can provide clear prompts to monitor and continuously improve effective teaching. When used as part of a formative assessment and measurement, rubrics have the potential to help instructors develop knowledge, skills, and dispositions as well as make dependable, consistent judgments about the quality of their own work (Davies, Welch, & Hargis, 2008).

This study adds to the literature by providing research-based methods to integrate the observation assessment data as part of a larger measurement and evaluation process.

APPROACH

This data collection was conducted at two universities, a small private Catholic liberal arts and a large research intensive, both in the Pacific Rim of the United States. For the updated data, 16 faculty members (eight female) were from the small private liberal arts university; and 24 faculty members (12 female) work at the large research intensive university. Data were collected over a two-year period including the 2014 to 2016 academic years. Participants from the prior study included 196 faculty members (102 female) from three different universities in two different countries. Seventy-six faculty (47 male) were from a mid-size comprehensive public university; eighty-three (52 female) from a private liberal arts university and thirty-seven (21 female) from a federal middle eastern college (Author, 2014).

A Three Stage Process for Evaluating Effective Teaching was developed and deployed.

I. Assessment
    a. Pre-Observation Meeting
    b. Observation
        i. Quantitative Checklist
        ii. Qualitative Field Notes
        iii. Faculty Flow Diagram
    c. Post-Observation Meeting
II. Measurement
III. Evaluation

Assessment (Collect Observational Data in Three Stages)

To initiate the classroom observation process, faculty voluntarily contact the Center for Teaching and Learning to request a classroom observation. The Center responds with a request to schedule a pre-observation visit to begin the process.

Pre-Observation Visit

There are several reasons why a faculty member might request a classroom observation. They might be addressing one or more student perception comments. They may wish to obtain documentation of their teaching for an upcoming promotion and tenure review or to add to their annual report as evidence for effective teaching. Most frequently, they are simply interested in continuous improvement and engaging in a lifelong learning model, similar to the one that they encourage for their students (Malmberg, Hagger, Burn, Mutton, & Colls, 2010).

Angelo and Cross (1993); and Davis (2009) suggest that an observer schedule a 15-30 minute session with the faculty member to be observed to share the process. For this study, a process that included three data instruments was used:

- A quantitative quality teaching checklist;
- Qualitative field-notes on teaching and learning activities; and

- A graphical faculty flow diagram diagramming noteworthy actions.

Prior to the observation, the observer and faculty member meet to discuss the process using the following Pre-Observation prompts.

1. What are the student learning outcomes (knowledge, skills & dispositions)?
2. What teaching approaches will be offered (active learning, discussion/Socratic, handouts, videos, lecture, demonstrations/simulations, project-based learning, etc.)?
3. What are the instructor goals for this session?
4. What can the observer expect the instructor to be doing in class?
5. What do you expect students to be doing to reach your goals?
6. How will you know that students have met your goals?

Observation

Using the three data collection instruments, the observer visits the classroom and collects observational data.

i. Quantitative Effective Teaching Checklist (Chism, 1999 reduced to 73 items)

The observer uses a quantitative teaching attribute checklist as a guide to identify which of the attributes are observed during the session. The observer uses notations other than a check indicating the behavior was observed. For example, the observer indicates NA or Unobserved; or a "Y" indicating "Yes" this was easily and often observed; likewise for an N for "No", etc. The goal for this more open notation is to provide the observer space to document what they observe in all of the nuances that we know happens in the art and science of teaching. It is understood that this list is limiting, and only captures a snapshot in time, indicating that the instructor may or may not have exhibited the ability to attend to an attribute once (or twice). The purpose of this checklist is not to use the number of attributes checked and conclude a level of instructor performance. The purpose is to note which of the attributes are observed, expand upon these in the Remarks section and if significant, expand upon what was observed in the Qualitative notes. Upon debriefing, the observer summarizes and shares the data in a conversation, where the faculty member being observed can ask questions and determine the value and/or intent of the attributes. Ultimately, it is up to the faculty member to place a value and evaluate each attribute as per their goals, class level, and individual instructional philosophy.

ii. Qualitative Field Narrative

The observer collects qualitative field notes of student behavior and specifics on their questions/responses; dis/engagement; student note-taking; work on their computers or other mobile devices (on/off task); talking or other distracting behavior; arriving late or leaving early.

iii. Faculty Flow Diagram

A visual faculty flow diagram, which graphically displays the movement of faculty and students who respond aloud during the session is created (Author, 2014). The observer diagrams the room configuration, complete with the location of doors, windows, whiteboards, etc. (or downloads the room schematic from the university website) as the location of these physical parameters may affect learner interaction. The observer also identifies the location of male/female students, and as they participate, make notations on when they respond. The observer documents which students are working on laptop computers, the movement of faculty around the class, and any other notable activity (i.e., classroom disruption, group activity movement, students arriving late, departing early, technology used or not working, students off/on task, etc.). Following the three-part data gathering, the observer creates a one-page summary of the events, similar to a field guide.

Post-Observation Debrief

To be most helpful, a post-observation debriefing occurred within one week of the observation. It was beneficial for the observer to begin the debrief by reiterating the purpose of the observation and maintain a collegial approach. The goal is not to be punitive, policing or "find" problems. The goal is to provide useful and specific information about teaching and learning dynamics so that the instructor can make informed evaluations. Throughout the entire debriefing session, the observer offers open-ended, non-assuming prompts.

Plans for the Future

Of the three stage process, we have collected extensive data on the first stage of Assessment, which includes the Pre-Observation Meeting; Observation (Quantitative Effective Teaching, Qualitative Field Narrative, and Faculty Flow Diagram) and Post-Observation Debrief. Combining this research with recent conversations with over two hundred faculty members, who have consistently requested more effective ways to evaluate teaching, we have created a Measurement rubric (Appendix A), which can be used in concert with the Observation data and Student Perception surveys for faculty to prepare their own data-informed self-evaluation of their teaching.

II. Measurement

An analytical rubric was created to assist faculty while interpreting and evaluating their assessment data. Portions of the rubric were derived from the Western Association of Schools and Colleges (WASC) Senior College and University Commission (WSCUC) (of which some portions were aligned with the Association of American Colleges and Universities (AAC&U) rubrics) and address an Initial, Emerging, Developed, and Highly Development indicators. For the fullest picture of an instructor's accomplishments, reviews of student survey materials (quantitative and comments) should be augmented with:

- Pre-observation discussion notes;
- Syllabus (aligned, measurable learning outcomes; assessments with rubrics; clear policies, which help create an engaging learning environment; sensible schedules, which provide complete information, perhaps links to external resources, etc.);
- Quantitative quality teaching checklist with remarks;
- Qualitative field-notes on teaching and learning activities;
- Graphical faculty flow diagram diagramming noteworthy actions;
- Post-observation debriefing notes; and
- One-page observation summary.

III. [Self] Evaluation (of the faculty member being observed)

The final aspect of this on-going cycle is evaluation. In this process, each faculty is provided the observation forms and rubric, which they use to evaluate themselves. Instructor outcomes for this step can vary widely and include

- descriptive narratives of the process culminating in a self-evaluation report;
- tables/charts/figures which summarize their systematic reflections on teaching and/or identifying challenges with associated actions to enhance;
- on-going development of teaching statements/philosophies, demonstrating an evolving instructional repertoire; or
- perhaps digital audio or video files, where faculty represent their teaching with voice or text overs in documents or [info]graphic representations (PowerPoints) to describe their thinking and intent.

The evaluation can be formative (obtained and reviewed while the course is being taught) and/or summative (at the the end of the term/year as part of an annual performance dossier). Above all, the evaluation is a "SELF" evaluation, which is performed by the faculty member and not the observer. This approach can empower the faculty member to play an active role in the evaluation of their career direction and progress. The main goal of this entire process is to provide useful and consistent data to help faculty evaluate their own teaching in individual and meaningful ways. The Center is available to discuss ways in which to evaluate the data and suggest methods, mechanisms and formats if the faculty member would like to initiate this conversation. However, the Center is a resource and not an evaluative entity (Yee, & Hargis, 2012).

Assessment Results

Over the twelve-year period, classroom observation data was collected from five different universities with highly varied demographics and mission. Universities included a Comprehensive with an enrollment of 16,000 students; a Liberal Arts with 6,000; a Middle East Women's College with 2,500; a small private Catholic university with 2,500; and a large research intensive with 33,000 students. Faculty member demographic data from the prior study is included in table 1. Table 2 includes observational data from the two additional universities.

Table 1. Faculty Member Demographics from Prior Study

Institution	Total	Female	AS	EIT	Law	BUS	Ed	Hlth
Comprehensive	76	29	36	8	0	10	13	9
Liberal Arts	83	52	34	6	10	0	9	24
Middle East	37	21	9	5	0	19	0	4
Total	196	102	79	19	10	29	22	37

AS – Arts and Sciences
EIT – Engineering and Information Technology (which includes Computer Science)

Bus – Business
Ed – Education
Hlth – Health (which includes Nursing, Pharmacy, Physical Therapy and Dentistry)

Table 2. Discipline and number of students for two additional universities.

Small Private Liberal Arts University
(Student Enrollment of 2,500)

Faculty Discipline	**# Students**
English	10
Literature	15
Psychology	25
Environmental Studies	18
Marine Ecology	15
Business	12
Philosophy -1	18
Philosophy -2	16
Religion	21
Sociology	22
Media	17
Sustainability	12
Criminal Justice	18
Education	11
Rhetoric	15
Marketing	19
Total = 16 Faculty	**265**

Large Research Intensive University
(Student Enrollment of 33,000)

Faculty Discipline	**# Students**
Political Science	110
History	90
Computer Science	240
Ecology Lab	35
Biology Education	80
Computer Engineering	170
Economics	250
Education	40
Anthropology	150
Visual Arts	20
Calculus	170
Anatomy	60
Japanese Language -1	60
Japanese Language -2	40
Physics I	100
History	270
Computers	160
Medicine	6
Electrical Engineering	135
Physics II	300
Philosophy	35
Endocrinology	100
Mathematics	125
Total = 24 Faculty	**2900**

DISCUSSION

This purpose of this paper is to share a method to gather useful data in addition to student surveys to help faculty, department chairpersons, and universities evaluate effective teaching. The method empowers faculty to

gather specific data, which can assist in their reflection and analysis on how they are and/or will become a more effective educator. The proposal requires three major stages, which include assessment; measurement; and evaluation. The assessment stage includes pre-observation; observation; and post-observation. Within the observation step, there is also three parts, a quantitative checklist; qualitative field narrative; and faculty flow diagram. For the measurement stage, we created an analytical rubric to help faculty make sense of the and prepare an evaluation of their teaching. One important aspect to keep in mind is that this proposal is a supplement to student surveys and not a replacement. We believe that students' perception of our instruction is critical, although it is only one piece of a much more complex storyline. If we are serious about improving our teaching and offering a high quality instructional experience to our students, then - as with most things in life - our approach will require careful consideration, resources and most of all, our time. This proposal is not a magic bullet that will quickly and perfectly determine teaching effectiveness. Although we can and do gather student perceptions quickly, through multiple choice and open response surveys at the end of the term, we have shared the evidence that clearly demonstrates that this approach is severely lacking in evaluating teaching effectiveness. We also believe that additional information, such as peer evaluations from colleagues can be useful, although produces an entirely different type of data. Peer evaluations (observations) are typically self-selected and can be biased due to the relationship between the observer and the faculty being observed. In addition, the peer evaluator frequently becomes focused on the content and not the pedagogy, therefore, we recommend that peer evaluators should be from outside one's own discipline. Finally, the peer evaluator most likely does not have experience in observing effective teaching, nor do they have the instruments, such as the one's in this proposal, especially the Faculty Flow Diagram, which has been seen to be the most helpful for faculty members.

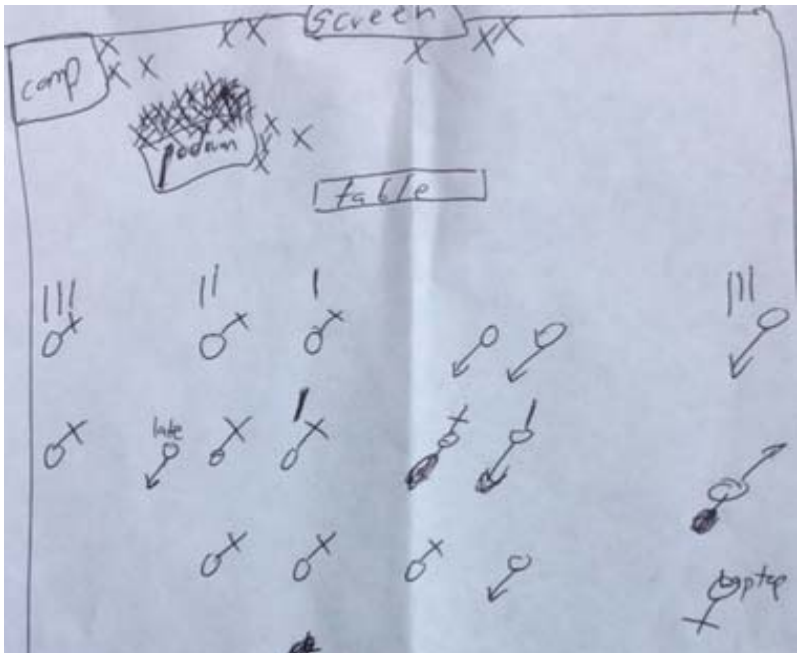


Figure 1. Example of a Faculty Flow Diagram of 18 students at a small Liberal Arts Catholic university

Faculty Flow Diagram Examples

One of the most unique and discussed aspect of the evaluating effective teaching proposal is the Faculty Flow Diagram (Figure 1). In these diagrams, such as the example in Figure 1, the "x's" represent the instructor at various times during the session, the gender symbol represent the location of each student and the marks near the student represent the number of times when the student spoke aloud (answering or asking a question). For Figure 1, you can see that the instructor remained mostly near the podium for the duration of the class session. When debriefing with the instructor, they shared the reason for this is that they felt they needed to be near the podium, which housed the computer, that operated the PowerPoint presented so they could advance the slides. When debriefing, it is key that the observer remains objective and avoid judgment on the instructor's behavior. Instead, the observer asks further questions, such as in this case, "what if we were to provide you with a remote control to advance your slides, where would be your preferred location in the class?" In this particular example, this question was asked and the instructor responded that they most likely remain near the podium because they felt that was where the students expected them to be. As an observer, the first author shared research on effective teaching, which included student engagement and how the instructor's movement could enhance engagement, especially if one of their goals was to encourage students to ask questions. Gunter, Shores, Jack, Rasmussen, and

Flowers (1995) found that when instructors increase their proximity control, or decrease the distance between them and students, that students are more likely to ask questions. When this happens, students are less anxious to talk aloud to an expert at the front of the room, and instead will quietly share their confusion when the instructor passes by them.

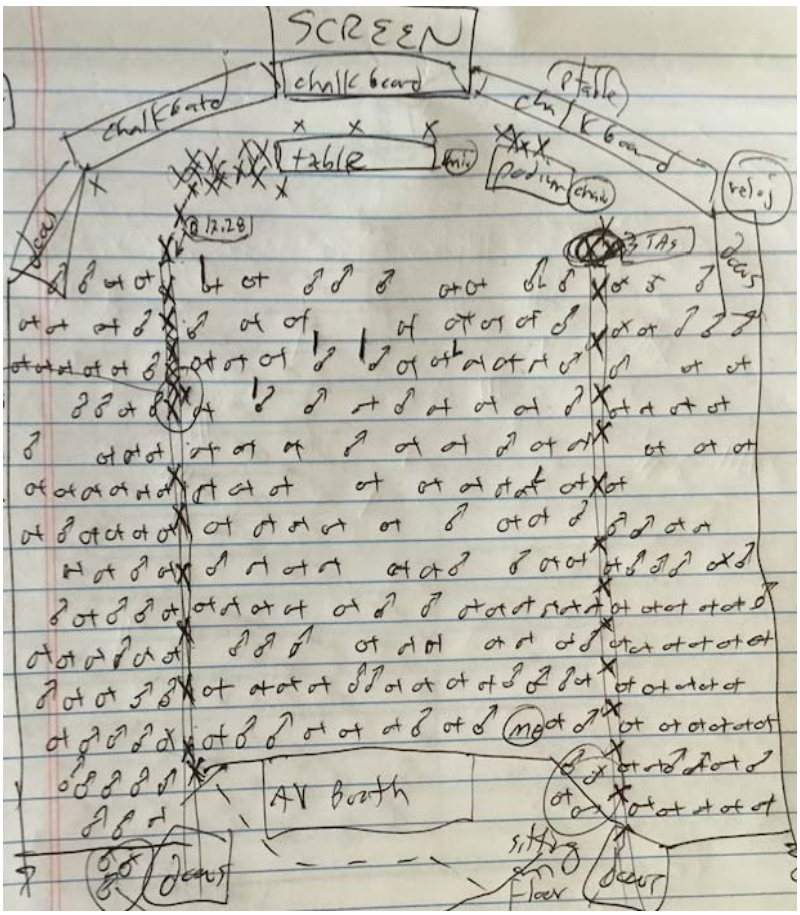


Figure 2. Example Faculty Flow Diagram from a large class at a Research Intensive university

At the other end of the class size spectrum, Figure 3 shows a Faculty Flow Diagram for a large class of approximately 300 students. Although you can see that there were not many questions from the students, that even in a very large class, an instructor can exhibit a heightened sense of proximity control by walking up the aisle. This approach allows the faculty to try and make a large class seem more personal, humanizing the dynamics as well as subtly monitoring for off-task activities. Most of the walking through the aisles occurred when the professor asked students to work on a problem and/or address an active learning method, such as Think/Share/Pair. The instructor in this example did have and use a remote to control what was being projected on the front screen.

Throughout the process of observing faculty in the classroom, the Center has identified several commons requests from faculty following their observations, such as

1. Interest on how they can offer more Active Learning opportunities, which we provide and discuss a list of 228 Active Learning methods to assist in student engagement;
2. How to engage students more frequently through Student Response Systems (SRS), which we share strategies including a simple four quadrant colored piece of paper (https://uminntilt.files.wordpress.com/2014/06/colored-abc_card.pdf) or electronic alternatives of Poll Everywhere (http://www.polleverywhere.com), Plickers (http://www.plickers.com), Go Formative (https://goformative.com), Kahoot (https://getkahoot.com) and Twitter (www.twitter.com);
3. How to create Electronic learning objects, which could include Learning Glass Video, Video Scribe, StopMotion, Screencast or a Green Screen;
4. How to create analytical rubrics using Rubistar, an online rubric generator; and
5. How to build a more effective syllabus using our Syllabus Guide.

Limitations

There are, of course limitations to this proposal. As mentioned above, the major limitation is time, as this approach will take significantly more time than current student surveys. However, we believe that many Centers for Teaching and Learning currently offer these services and could develop ways to scale the services to accommodate the need. Possible ways could include paying a stipend to Faculty Fellows, training Adjunct Professors, identifying faculty who might be interested in this as part of their research agenda, and increasing the staff in Centers.

A second limitation and perhaps question is how large of a class is too large for the Faculty Flow Diagrams? The first author was able to draw and track a class of 300 students while at the same time monitoring the checklist and writing field notes. It has taken him several years of experience to be able to manage collecting data on three different instruments simultaneously, so class size could be a limitation.

Finally, interpreting the assessment data, while using the measurement rubric could be a challenge for faculty with limited experience in the social sciences. We believe that Centers could assist with this and ultimately (with permission) share showcase examples of faculty interpretations on their website so other faculty could use as a model.

Overall, we are hopeful that this proposal or perhaps specific data collection instruments could be helpful in enhancing university ability to evaluate effective teaching and supplement the current use of student perception surveys.

References

Angelo, T.A., & Cross, K.P. (1993). *Classroom assessment techniques: A handbook for college teachers*. (2nd ed.). San Francisco: Jossey-Bass.

Author, J. (2014). A ten year study of faculty classroom observations. *Transformative Dialogues: Teaching and Learning Journal*, *7*(2), 1-21.

Bain, K. (2004). *What the best college teachers do*. Cambridge, Mass: Harvard University Press.

Benton, S.L., & Cashin, W.E. (2012). *Student ratings of teaching: A summary of research and literature*. IDEA Paper No. 50. Manhattan, KS: The IDEA Center. Retrieved from http://www.theideacenter.org/sites/default/files/idea-paper_50.pdf

Boring, A., Ottoboni, K., & Stark, P. (2016). Student evaluations of teaching (mostly) do not measure teaching effectiveness. *ScienceOpen Research*.

Boyer, E. (1990). *Scholarship reconsidered: Priorities of the professoriate*. San Francisco: Jossey-Bass.

Bransford, J., Brown, A., & Cocking, R. (1999). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.

Brown, S., Race, P., & Smith, B. (2005). *500 tips on assessment*. (2nd ed.). New York: Routledge.

Biggs, J. (2002). *Aligning Teaching and Assessment to Curriculum Objectives. Imaginative Curriculum Guide*. Retrieved from http://www.itslifejimbutnotasweknowit.org.uk/files/CPLHE/Biggs%20Constructive%20alignment.rtf

Carrell, S.E., & West, J.E. (2010). Does professor quality matter? Evidence from random assignment of students to professors. *Journal of Political Economy*, *118*(3), 409-432.

Chickering, A., & Gamson Z. (1987). *Seven principles for good practice in undergraduate education*. Reprinted by University of Illinois, Springfield.

Chism, N. (1999). *Peer review of teaching: A sourcebook*. Bolton, MA: Anker.

Clayson, D.E. (2009). Student evaluations of teaching: Are they related to what students learn? A meta-analysis and review of the literature. *Journal of Marketing Education*, *31*(1), 16-30.

Conroy, M., Asmus, J., Ladwig, C., Sellers, J., & Valcante, G. (2004). The effects of proximity on the classroom behaviors of students. *Behavioral Disorders*, *29*(2), 119-129.

Danielson, C., & McGreal, T. (2000). *Teacher evaluation to enhance professional practice*. Alexandria, VA: Association for Supervision and Curriculum Development.

Davis, B.G. (2009). *Tools for teaching*. San Francisco, CA: John Wiley & Sons, Inc.

Davies, J., Welch, C., & Hargis, J. (2008). The bridge course design: Faculty collaboration and cross-course formative assessment. *International Journal for Scholarship of Teaching and Learning*, *2*(2), 6.

Gibbs, F. (1981). *Teaching students to learn: A student-centred approach*. Milton Keynes, England: The Open University Press.

Goe, L., & Croft, A. (2009). *Research to practice: Methods of evaluating teacher effectiveness*. Washington, D.C.: National Comprehensive Center for Teacher Quality.

Gunter, P., Shores, R., Jack, S., Rasmussen, S., & Flowers, J. (1995). On the move: Using teacher/student proximity to improve students' behavior. Teaching Exceptional Children,28(1), 12.

Hargis, J., Cavanaugh, C., Kamali, T., & Soto, M. (2014). A federal higher education iPad mobile learning initiative: Triangulation of data to determine early effectiveness. *Innovative Higher Education*, *39*(1), 45-58.

Huba, M. E., & Freed, J. E. (2000). Learner centered assessment on college campuses: Shifting the focus from teaching to learning. *Community College Journal of Research and Practice*, *24*(9), 759-766.

Humphreys, D. (1998). The impact of diversity on college students: The latest research. *Campus Diversity Initiative, American Association of State Colleges and Universities and Ford Foundation.* Retrieved from http://www.inform.umd.edu/diversityweb/NewsRoom/studbenefit.html

Isaacs, G. (2001). Assessment for Learning, University of Queensland, Brisbane, pp. 10-11.

Jenkins, A., Blackman, T., Lindsay, R., & Paton-Salzberg, R. (1998). Teaching and research: Students' perspectives and policy implications. *Studies in Higher Education*, *23*(2), 132.

Macquarie University Learning & Teaching Centre. (2010). Retrieved from http://www.mq.edu.au/about/about-the-university/offices-and-units/learning-and-teaching-centre

Maki, P. L. (2012). *Assessing for learning: Building a sustainable commitment across the institution*. Stylus Publishing, LLC.

Malmberg, E., Hagger, H., Burn, K., Mutton, T., & Colls, H. (2010). Observed classroom quality during teacher education and two years of professional practice. *Journal of Educational Psychology*, *102*(4), 916-932.

Murray, H.G. (2005). Student evaluation of teaching: Has it made a difference? *Paper presented at the Annual Meeting of the Society for Teaching and Learning in Higher Education*, Charlottetown, Prince Edward Island, June 2005.

Race, P. (2001). *The Lecturer's Toolkit: a practical guide to Learning, Teaching & Assessment.* Farmer, London: Routledge.

Sadler, R. (2005). Interpretations of criteria-based assessment and grading in higher education. *Assessment & Evaluation in Higher Education*, *30*(2), 175–194.

Sebastiá, M., Catalá-Icardo, M., Mengual, J., González, J., Meseguer-Lloret, S., Torres-Cartas, S., Llinares-Palacios, L., Gómez-Benito, C., & Lull-Noguera, C. (2011). Rubrics as a bridge between assessment and learning: An experience in a Bachelor's degree in environment sciences, *EDULEARN11 Proceedings*, pp. 1986-1994.

Siddiqui, Z., Jonas-Dwyer, D., & Carr, S. (2007). Twelve tips for peer observation of teaching, *Medical Teaching*, *29*(4), 297-300.

Stark, P. (2016). An evaluation of course evaluations. *ScienceOpen Research*, 1–7.

Stefanou, C., & Salisbury-Glennon, J. (2002). Developing motivation and cognitive learning strategies through an undergraduate learning community, *Learning Environments Research*, *5*(1), 78.

Uttl, B., White, C., & Gonzalez, D. (2016). Meta-analysis of faculty's teaching effectiveness: Student evaluation of teaching ratings and student learning are not related, Studies in Education Evaluation.

Yee, K., & Hargis, J. (2012). Indirect faculty development and the role of sociability. *Journal of Centers for Teaching and Learning*, *4*, 61-79.

Walsh, M., Millar, M., & Westfall, R. S. (2016). The effects of gender and cost on suspicion in initial courtship communications. *Evolutionary Psychological Science*, *2*(4), 262-267.

Zimmerman, B. (1998). Developing self-fulfilling cycles of academic regulation: An analysis of exemplary instructional models. In D. Schunk & B. Zimmerman (Eds.). *Self-regulated learning: From teaching to self-reflective practice*. New York: Guildford Press.

APPENDIX

Appendix A. Rubric for Measuring Teaching Effectiveness.

Criteria	Initial - Emerging - Developed
Observation (pre-discussion)	The instructor has clearly articulated the ... - concepts and learning outcomes for the session; - teaching approaches which will be offered (active learning, discussion, Socratic, handouts, videos, lecture, demonstrations/simulations, etc.); - a detailed conceptual lesson plan for the session; - their instructor goals for this session and a consistent method on how they will share these with students; - specific expectations that they have of students for the session, which will enable them to reach their goals; and - an assessment of student learning, which will provide substantive data on student abilities (knowledge, skills and/or dispositions) after the class session.
Syllabus	The syllabus contains … - a teaching philosophy, which describes the instructional approach as it aligns with research-based effective teaching; - contact information (Instructor's name, email, phone number, office location, office hours, website, etc.); - course information (Course name/section number, credit hours, description, active, higher-level measurable Learning Outcomes well-aligned to assessments and department/university outcomes); - course policies, including attendance, academic integrity and student engagement; - ADA and Title IX compliance statements; - calendar with exams or other culminating learning opportunity date and time; - information about campus resources; - a policy on student decorum and appropriate, relevant and meaningful educational technology that encourages high-level discussions; - formative and authentic assessments with analytical rubrics; and - sensible schedules, which provide useful information to guide learners through conceptual frameworks.
Observation (quantitative)	During the observation, a substantial number of effective teaching attributes were documented, such as - Presentation skills (audible voice, varies the tone, avoids distracting mannerisms or reading from notes, maintains eye contact, spoke at effective pace, uses space well, is enthusiastic); - Rapport with students (addresses by name, attends to comprehension, provides feedback, uses reinforcement, incorporates student ideas, welcomes participation, motivates students, has appropriate sense of humor, uses effective classroom management, treats students impartially); - Clarity (defines and elaborates new concepts, uses examples, pauses for questions, responds and explains clearly, relates practical situations) - Instructor organization (arrives on time, states relation of the class, knows how to use ed tech, posts goals, is well-prepared, ensures learning activities are organized); - Content knowledge (incorporates current research, identifies sources, communicates reasoning behind operations, is knowledgeable and confident, pitches instruction to an appropriate level, demonstrates intellectual curiosity); - Variety and Pacing (uses more than one form of instruction, accepts students responses, draws nonparticipants into the discussion, helps students extend their responses, maps the direction of the discussion, provides directions for active learning tasks and how they will be evaluated); and - Instructional Strategies (teaching techniques is appropriate for goals, has a good, broad level of questioning skills, mediates discussion well, proceeds at an appropriate pace, ensures presentations are legible and organized, provides clear directions and facilitates group work well, helps students to learn from each other, effectively holds class attention).
Observation (qualitative)	The faculty member was fully aware and is able to identify and assess specific student behavior which their lesson attempts to elicit. Behaviors such as the following were observed and fully reconciled: - substantial student questions and responses; - engagement reinforced and/or lack of engagement addressed;

	- note-taking in various forms or other means of student interaction afforded; - working productively on mobile devices and/or distracted and addressed; - actively discussing valued and other distracting behavior addressed; and - behaviors such as arriving late or leaving early addressed.
Observation (Faculty Flow Diagram)	When reviewing the Faculty Flow Diagram, the instructor is highly reflective and is able to identify and suggest strategies to address - on if the student dynamics were what they had intended; - meaningful trends (more students responded in the front/back/T-box; gender differences, dominating students, instructor movements, etc.); - do these trends mean anything to the faculty member; - Would they like to increase or decrease certain behaviors; and - their movement and discuss how this facilitated learning and engagement.
Observation (post-discussion)	Following the observation, the instructor was able to substantially describe - their impression of how the session went, identifying key strengths and weaknesses, and rationale or hypothesis on why they believed so; - their thoughts and perspectives on learner interactions; - the quality and quantity of how well students accomplished outcomes; - potential variables for why activities may not have gone as planned; - clear areas of improvement and perhaps steps for improving; - how they can ensure students were attending, processing and applying to the instructor goals and how they knew it at the end of the session; and - different type and level of questions, as well as knowing when to ask each.
Teaching Philosophy	The teaching philosophy includes - a clear conception of teaching and learning as it connects to empirical evidence (including ways in which you integrate cultural diversity, access to underrepresented groups, attention to different ways of learning, creating an open and safe learning environment, classroom dynamics, etc.); - a complete description of how you teach and a deep background on why you selected those approaches, as well as indicators of how their effectiveness (diversity of methods, level of interaction, quality of feedback, intercultural sensitivity); - multiple, high quality examples of how you have been reflective and purposeful about your teaching; - clear aspirational goals as an instructor and corresponding actions; - rationale of your teaching values, beliefs, and goals; - a set of elevated criteria to assess, measure and evaluate the quality own teaching; - research based methods for assessing, measuring and evaluating students' learning with associated analytical rubrics; and - foundational information, such as courses you have taught, samples of course syllabi, teaching evaluations, letters of recommendation and a video of a class you have taught.

ADDRESSING SCIENTIFIC LITERACY THROUGH VIRTUAL SCIENCE CENTRE IS BETTER COMMUNICATED THROUGH FREE CHOICE COMPARED TO PROBLEM BASED LEARNING?

Norfarah Nordin
Graduate School of Business, Universiti Sains Malaysia,
norfarah@usm.my

Mohd Ali Samsudin
School of Educational Studies, Universiti Sains Malaysia,
alisamsudin@usm.my

Daniel Loy Hui Siang
Petrosains Discovery Centre Malaysia,
Daniel.loy.hui.siang@gmail.com

ABSTRACT
This study compares the effects between free-choice learning (FCL) and problem-based learning (PBL) in a virtual science centre. It is hypothesized that effective approach to communicate virtual science centre content has a significance impact on improving visitors' scientific literacy. Three constructs of scientific literacy identified were general science knowledge, nature of science, and scientific reasoning. The research sampled 72 secondary school students in Malaysia. MANCOVA technique was used in the study. The results demonstrated that FCL approach has higher post-means test scores on scientific literacy constructs compared to the PBL group.

INTRODUCTION
This study compares the effects of free-choice learning (FCL) and problem-based learning (PBL) methods in a virtual science centre to improve Malaysian school students' scientific literacy. The need to address scientific literacy among Malaysian youths is important. Scientific literacy among Malaysian is far below what is required to shift Malaysia towards globally prepared populace (Ministry of Education Malaysia, 2012; Malaysian Science and Technology Information Centre, 2010). Now numbers of Malaysians students utilizing internet and acceptance for using digital platforms for learning is elevated. Therefore, the significance of virtual science centre visits for learning needs to be endorsed. What type of approach a virtual science centre should adopt to support these platforms to communicate their content to boost scientific literacy among student? This study would like to contribute to literature on informal learning of science as an important contributor on how Malaysian students' learn about science in general.

The study compared the effectiveness of a virtual science centre way of communication. The study capitalized on a virtual science centre named MYSains which was developed to support this experimental study. The virtual science centre was built from an existing popular platforms and technologies to ensure wide and easy access. It accommodates both FCL and PBL (through the use of an online learning management system). Both approaches integrate social media and communication tools to provide rich opportunities for interaction and engagement, including the potential for real-time communications. The learning content was organized and developed employing best practices of online media design and anchored on science centre learning approaches. Its key features includes: diverse learning content types; social media integration; virtual world learning environment; Malaysian contextualization; and convenient web access.

A working definition for scientific literacy was established together with the identification of the relevant evaluation instruments. Scientific literacy consists of three key measurable subsets; possession of sufficient general science knowledge, understanding the nature of science, and having scientific reasoning skills. Although scientific literacy is a complex and highly contextual outcome (Feinstein, 2011), the definition adopted here builds from a functional perspective which first recognizes the need for individuals to acquire general science knowledge lifelong as a basis for being scientifically literate (Bransford et al., 2000).

Once sufficient general science knowledge is acquired, a deeper realization of the scientific process and how science knowledge is discovered becomes critical (J. Wenning, 2006). Scientific literacy is not only a body of knowledge but also an approach and process which has become significant in human culture. It represents among the ideals of human thinking, as expressed in the nature of science, be it science processes or the concepts from which science knowledge is derived from (J. Wenning, 2006; Miller, 2002). Scientific literacy empowers

individuals with the ability to reason, or weighs available data through a sieve of scientific processes and evidence-based judgments (Committee on Learning Science in Informal Environments, 2009). This can be further described as the logical rationalizing of available evidence that will lend support towards an eventual decision or position.

Problem-based Learning Approach in MYSains

The use of problem-based learning (PBL) approach has been established in science centres as a subset of a socially constructivist learning approach (Yew & Schmidt, 2012) with elements of inquiry-based learning. The use of inquiry-based learning describes situations in which learners are presented with a scenario or problem, and together with the assistance of a facilitator, will attempt to address the given scenario or problem through 'a process of exploring the natural or material world, and that leads to asking questions, making discoveries, and rigorously testing those discoveries in the search for new understanding' (Rankin, n.d.). Inquiry-based teaching is a central feature for science education and this has been replicated in various approaches and forms in informal science learning institutions as well (National Science Education Standards, 1996).

Science centres through demonstrations, workshops, and activity sheets often apply elements of inquiry-based learning, particularly PBL as a natural complement to the science centre approach which is often anchored on questioning, a central behaviour of inquiry (Committee on Learning Science in Informal Environments, 2009). Science centres design and curate learning experiences that often evoke curiosity and wonderment, and encourages people to be self-motivated to explore and engage and this is done oftentimes through the presentation of a problem question whether in the form of an exhibit label, a workshop goal, or an activity worksheet. For MYSains virtual science centre, a similar approach was adopted and translated into the digital medium. Using Barrows (1996) primary characteristics of PBL as a guide, the use of PBL for MYSains is described as follows:

i. Learning is student centered in which students are the drivers for learning, deciding on their own what and how to learn.

ii. Learning occurs in small student groups which will be managed and constrained by the online PBL system available.

iii. Teachers are facilitators or guides and will be trained and supported to play this role.

iv. Problems formed the original focus and stimulate learning and these are often ill-structured, in the sense that students are unable to immediately conceptualise or frame an answer. Example, the presented PBL for MYSains is "Create a science blog post for the MYSains Virtual Science Centre which presents and answers a science-based question both effectively and accurately".

v. Problems are a vehicle for the development of clinical problem solving skills, in which students are required to progressively address various challenges (such as beginning to first understand and define what a blog post is) before being able to address the problem directly (creating a blog post on a science-based question).

vi. New information is acquired through self-directed learning and this is evident in this problem as students have to first understand the requirements of the assignment select and define a usable and compelling science-based question, formulate the answers, and then communicate their findings in an effective and engaging way to the extent in which the medium allows.

As the problem questioning is the pre-cursor to a successful PBL lesson, the problem question presented has to meet certain standard and was aligned to the nature and intent of a PBL approach. Barrows (1990) defines a good problem question as follows: a) have a variable definition; b) lack necessary preliminary knowledge; c) no existing absolute answer; and d) have different problem perspectives. Against this, the problem question identified checks off the list completely as the question, "Create a science blog post for the MYSains which presents and answers a science-based question both effectively and accurately" can be defined in various ways (as blog posts are rich and varied), will require students to find new knowledge in order to address the provided question which will be intentionally beyond the scope of the curriculum, and can be addressed from various perspectives with no one right answer.

The classroom group of forty students undertaking a PBL approach will be divided into eight smaller groups consisting of five students per group. The classroom teacher will debrief the students on the PBL lesson plan and subsequently assign each student to a group and provide access to the online system. All communications from

the facilitator to the group will be done online while students can choose to both communicate within their groups online and in the classroom, during time allotted for this activity, which also includes exploring the MYSains as a key resource base. It is estimated that approximately an hour a week of classroom time will be dedicated to using the MYSains, with unlimited usage outside of the classroom subject to student's motivations and interests.

Free-Choice Learning Approach in MYSains

In free-choice learning (FCL) the learner themselves have full control over the learning objectives but may or may not have similar control over the means of learning (Mocker & Spear, 1982). Additionally, other than control over the learning objectives, another defining characteristic of FCL is that it is often experienced episodically rather than continuously (Committee on Learning Science in Informal Environments, 2009). These characteristics typifies what happens in numerous informal learning experiences including the MYSains in which learners ultimately decide what they learn and drives this learning from their own motivations and interests, although learning outcomes are possibly influenced from the way the learning experiences are designed.

In general, FCL environments like a virtual science centre places the learning responsibility with the learners themselves and finds a welcoming home in the online environment which by nature of the medium lends itself naturally to a free-flowing, learner-guided model of interaction (Allison-Bunnell & Schaller, 2005). In some ways, the increasing prevalence and use of the Internet has in turn encouraged and popularized FCL (Goldman & Dierking, 2005), through providing millions of people worldwide access to diverse learning resources accessible at their own time, pace, and of their choosing. A virtual science centre or rather most online offerings are typically experienced in a very similar form to that of a physical science centre visit. Physical galleries are analogous to specific web pages or digital offerings, while the whole institution reflects the complete set of experiences available. People select the offerings be it galleries or web pages that appeal to them and decide how long to spend, what to see and do, and ultimately what they learn from the experience. These experiences can happen consistently, occasionally, or by chance both in the physical and virtual realm as is typical of FCL (Committee on Learning Science in Informal Environments, 2009).

A FCL approach to using the MYSains entrusts the users themselves to be accountable for their learning by self-selecting topics of interests and deciding on their own how much they would like to take out of, and contribute to the learning experience available. Users can browse through the numerous learning galleries consisting of various content types, engage with others via the Zanadu virtual learning environment, and interact via social media connections that are available. Just as a physical science centre, users of MYSains need not do everything that's on offer but rather select and choose what they like, when they like, and from wherever that's suitable be it at home, in school, and across various Internet-enabled devices.

The classroom group of forty students who will use the MYSains in a FCL form will be provided approximately an hour a week off classroom time to explore MYSains in whatever way they choose to. No guidelines will be given, or any requirements set, except that the allotted time provides some basis for which to ensure that usage of MYSains has occurred. Although a true FCL platform fully empowers learners to decide when they would like to engage in the learning experiences on offer, the nature of the study does require some element of use within a constrained time frame. This approach of a minimum hourly use a week is still episodic and without additional impositions, will still reflect the FCL approach.

Scientific Literacy Measures

This study compares the effects of FCL and PBL methods in a virtual science centre environment using the MYSains on three identified constructs of scientific literacy, being general science knowledge, nature of science, and scientific reasoning among Form Four secondary school students in Malaysia. To assess this, three instruments that was used are; Parts C, D, & E of the Questionnaire on The Public's Awareness of Science & Technology in Malaysia, 2008 (Malaysian Science and Technology Information Centre, 2010); Nature of Science Literacy Test (J. Wenning, 2006); and Classroom Test for Scientific Reasoning (Lawson, 1978).

A purposive sampling approach was done to identify the groups being one classroom cohort adopting the free-choice learning approach, and one using a problem-based learning method. For all groups, a common pre-test and post-test was administered with treatment spanning 8 weeks. MANCOVA inferential statistical technique adopted to test the hypotheses and answer the research questions. Quantitative data was collected and analysed using Statistical Package for the Social Sciences (SPSS). Additionally, interview was conducted on qualitative data to lend depth and dimension to the findings.

SAMPLING

The sample consists of two full classrooms with 35 students using MYSains in a FCL approach and 37 students in a PBL approach. Data collection proceeded with a pre-test administered prior to using MYSains, and a post-test at the end of the data collection period. The MYSains was accessed by the students through either computer or tablets. To ensure equitable access, students were also allowed to use the school's computers for a minimum of one hour per week. Students could also bring their own laptops or tablets and connect them to the school's network to gain internet access and connected to MYSains.

INSTRUMENTATION

To investigate the effects of FCL and PBL methods in a virtual science centre environment on general science knowledge, nature of science, and scientific reasoning among Form Four secondary school students, three instruments was used in this study selected specifically to address each of the attribute studied. Additionally, given the context of the study situated in an online learning environment of the virtual science centre and the prevalence of some degree of user autonomy (higher for the free-choice group), the ability of students to self-regulate their learning is an influential and important indicator for learning effectiveness (Barnard, Lan, To, Paton, & Lai, 2009). Thus, the inclusion of an additional instrument to identify students' ability to self-regulate their learning online provides useful measures to determine how prepared the students are for using the MYSains Virtual Science Centre.

Table 1: List of instruments used against attribute studied

Number	Instruments	Attribute Studied
1	Adapted from Parts C, D, & E of the Questionnaire on The Public's Awareness of Science & Technology in Malaysia, 2008 (Malaysian Science and Technology Information Centre, 2010)	General Science Knowledge
2	Nature of Science Literacy Test (J. Wenning, 2006)	Nature of Science
3	Classroom Test for Scientific Reasoning (Lawson, 1978)	Scientific Reasoning
4	Online Self Regulated Learning Questionnaire (Barnard et al., 2009)	Self-regulated Learning

These four instruments have been in widespread use and the authors have clearly established the validity and reliability of the tools. A pilot test was undertaken for the instruments identified with 40 Form Four Secondary school students in order to assess usability and find the reliability coefficient. For Likert-scales, an Alpha Cronbach analysis was used while for dichotomous response items, a Kuder Richardson 21 analysis was adopted. The results of the pilot test of the final instrument achieved reliability coefficients of 0.88 that is more than 0.7.

The study posits the following questions, starting with the main question of the study which is:

Q_1: Are there any significant differences on the result of post-test of general science knowledge, nature of science, and scientific reasoning between students who used problem-based learning approach and students who used free-choice learning approach when they are visiting the Virtual Science Centre?

The sub-questions of the study are:

Q_{1a}: Is there any significant difference on the result of post-test of general science knowledge between students who used problem-based learning approach and students who used free-choice learning approach when they are visiting the Virtual Science Centre after the influences of pre-test of general science knowledge is controlled?

Q_{1b}: Is there any significant difference on the result of post-test of understanding nature of science between students who used problem-based learning approach and students who used free-choice learning approach when they are visiting the Virtual Science Centre after the influences of pre-test of understanding nature of science is controlled?

Q_{1c}: Is there any significant difference on the result of post-test of scientific reasoning skills between students who used problem-based learning approach and students who used free-choice learning approach when they are visiting the Virtual Science Centre after the influences of pre-test of scientific reasoning is controlled?

DATA ANALYSIS

In order to compare the effectiveness of PBL and FCL approach in using the MYSains on student's scientific literacy; measured by general science knowledge, understanding of the nature of science, and scientific

reasoning skills, Multivariate Analysis of Covariance (MANCOVA) inferential statistical technique was used. By using MANCOVA, the pre-test variations among the sample can be statistically accounted for and managed through the use of co-variances. In this way, the effect of using MYSains can be better analysed and compared between the two approaches. As the sampling for this study is not randomly assigned, the use of MANCOVA provides powerful statistical reasoning to account for any differences in the control variables or covariates among the two cohorts. This corrects for any errors that may arise should one cohort's mean scores fall outside of the population average.

This study also includes additional qualitative data obtained from structured and unstructured conversations in the MYSains chatroom spaces. In conversation analysis, the data is both naturally occurring (e.g. free flowing chat-room conversation) and recorded (Torrien, 2013). The nature of the chatroom conversation means that the conversational data is already transcribed as recorded in printed text. The final stages of the conversation analysis were to identify and assign meaning to patterns as they emerge (Torrien, 2013). An applied form of conversation analysis is used here in which the data is looked at with an open-mind but subsequently, the study of the emergent patterns are framed within the context of the study (Have, 1999). The use of peer-checking improves the validity and reliability of the findings.

RESEARCH FINDINGS

In reviewing the main hypothesis ($\mathbf{H_{01}}$), the Wilks' Lambda test of statistical significance was applied.

$\mathbf{H_{01}}$ There is no significant difference on the linear combination of means scores of post-test of general science knowledge, nature of science, and scientific reasoning between students who used problem-based learning approach and students who use free-choice learning approach when they are visiting Virtual Science Centre after the influences of pre-test of general science knowledge, nature of science, and scientific reasoning are controlled.

The multivariate analysis tests each factor effect on the dependent groups. The three dependent variables are the post-test results for General Science Knowledge, Nature of Science, and Scientific Reasoning. For group effects, the value of probability needs to be less than .05 ($p<.05$) for the effects to be significant. The group effects show a probability value of $F (3, 59) = 3.59$, and $p = .02$; Wilks' Lambda = .85; Partial Eta Squared = .15 which shows significant effects. This means that there are statistically significant differences in the linear combination of the three post-test mean scores between groups, therefore rejecting the main hypothesis ($\mathbf{H_{01}}$).

To further investigate the nature of the significance of the sample for General Science Knowledge, Nature of Science, and Scientific Reasoning, a paired samples t-test is performed between the pre-test and post-test scores to determine the significance of improvements for each item. It is found that mean scores of the General Science Knowledge post-test for students is 112.04 with standard deviation of 11.25, for Nature of Science post-test for students is 15.04 with standard deviation of 3.40, and Scientific Reasoning post-test for students is 7.83 with standard deviation of 2.98. There was a statistically significant increase in post-test scores for General Science Knowledge and Scientific Reasoning with mean increase for General Science Knowledge being 11.56 with a 95% confidence interval ranging from 9.26 to 13.86 while for Scientific Reasoning, a mean increase of .94 with a 95% confidence interval ranging from .08 to 1.81. Although Nature of Science shows an increase in post-test mean scores, the increase is not statistically significant.

First Sub Hypothesis

The univariate test of statistical significance is used to review the first sub hypothesis ($\mathbf{H_{01a}}$), which stated that:

$\mathbf{H_{01a}}$: There is no significant difference on the mean scores of post-test of general science knowledge between students who used problem-based learning approach and students who use free-choice learning approach when they are visiting Virtual Science Centre after the influences of pre-test of general science knowledge is controlled.

The univariate analysis of subjects' post-test scores on General Science Knowledge for free-choice and problem-based learning are $F (1, 67) = 14.10$, Mean Square = 152.78 and $p = .00$. This is an indication that the differences in the scores of post-test on General Science Knowledge between the two groups are significant. The first sub hypothesis ($\mathbf{H_{01a}}$) can therefore be rejected as the differences on General Science Knowledge scores between the free-choice and problem-based learning groups are significant.

To further investigate the nature of the significance between the groups, a paired samples t-test is performed between the pre-test and post-test General Science Knowledge scores to determine the significance of improvements for each group. It is found that mean scores of the General Science Knowledge post-test for students who use PBL is 112.24 with standard deviation of 10.73, whereas the mean score of General Science

Knowledge post-test for students who use FCL is 113.11 with standard deviation of 9.09. There was a statistically significant increase in post-test scores for both groups with mean increase for PBL being 10.19 with a 95% confidence interval ranging from 5.65 to 14.73 while for FCL, a mean increase of 14.29 with a 95% confidence interval ranging from 10.13 to 18.44. This means FCL is a better learning approach to be used when visiting MYSains compared to PBL for improving General Science Knowledge.

Second Sub Hypothesis

The univariate test of statistical significance is used to review the first sub hypothesis ($\mathbf{H_{01b}}$), which stated that:

$\mathbf{H_{01b}}$: There is no significant difference on the mean scores of post-test of understanding nature of science between students who used problem-based learning approach and students who use free-choice learning approach when they are visiting Virtual Science Centre after the influences of pre-test of nature of science is controlled.

The univariate analysis of subjects' post-test scores on Nature of Science for FCL and PBL are F (1, 67) = 0.18, Mean Square = 1.63 and p = .67. This is an indication that the differences in the scores of post-test on Nature of Science between the two groups are not significant. The second sub hypothesis ($\mathbf{H_{01b}}$) is therefore failed to be rejected as the differences on Nature of Science scores between the FCL and PBL groups are not significant.

Even though the differences are not significant, it is useful to review whether there is a significant improvement from Nature of Science pre-test to Nature of Science post-test for each group using a paired samples t-test. It is found that mean scores of the Nature of Science pre-test for students who use problem-based learning is 14.89 with standard deviation of 3.62, whereas the mean score of Nature of Science post-test for the same group of students is 15.73 with standard deviation of 3.51. It is also found that mean scores of the Nature of Science pre-test for students who use FCL is 13.71 with standard deviation of 2.82, whereas the mean score of Nature of Science post-test for the same group of students is 14.31 with standard deviation of 3.18. There was no statistically significant increase in post-test scores for both groups with mean increase for PBL being 0.84 with a 95% confidence interval ranging from -0.47 to 2.15 while for FCL, it is 0.60 with a 95% confidence interval ranging from -0.82 to 2.02. Thus, it is concluded that there is no significant improvement from pre-test Nature of Science to the post-test Nature of Science when the data is analyzed separately for each group (PBL and FCL).

Third Sub Hypothesis

The univariate test of statistical significance is used to review the first sub hypothesis ($\mathbf{H_{01c}}$), which stated that:

$\mathbf{H_{01c}}$: There is no significant difference on the mean scores of post-test of scientific reasoning skills between students who used PBL approach and students who use FCL approach when they are visiting Virtual Science Centre after the influences of pre-test of scientific reasoning is controlled.

The univariate analysis of subjects' post-test scores on Scientific Reasoning for free-choice and problem-based learning are F (1, 67) = 0.98, Mean Square = 7.12 and p = .33. This is an indication that the differences in the scores of post-test on Scientific Reasoning between the two groups are not significant. The third sub hypothesis ($\mathbf{H_{01c}}$) is therefore failed to be rejected as the differences on Scientific Reasoning scores between the FCL and PBL groups are not significant.

Even though the differences are not significant, it is useful to review whether there is a significant improvement from Scientific Reasoning pre-test to Scientific Reasoning post-test for each group using a paired samples t-test. It is found that mean scores of the Scientific Reasoning pre-test for students who use problem-based learning is 8.27 with standard deviation of 3.75, whereas the mean score of Scientific Reasoning post-test for the same group of students is 8.65 with standard deviation of 2.95. It is also found that mean scores of the Scientific Reasoning pre-test for students who use FCL is 5.43 with standard deviation of 2.59, whereas the mean score of Scientific Reasoning post-test for the same group of students is 6.97 with standard deviation of 2.80. Only FCL had a statistically significant increase in post-test scores with mean increase of 1.54 with a 95% confidence interval ranging from 0.36 to 2.72. Thus, it is concluded that there is a significant improvement from Scientific Reasoning pre-test to Scientific Reasoning post-test for students who used FCL approach when visiting Virtual Science Centre. On the other hand, there is no significant improvement from Scientific Reasoning pre-test to Scientific Reasoning post-test for students who used PBL approach when visiting Virtual Science Centre.

Summary of Findings

Firstly, after using MYSains, all students recorded an increase in their general science knowledge based on a comparison of the pre-test and post-test scores and this increase is found to be significant. However, the students who used a FCL approach showed a greater increase than the students in the PBL group in their post-test scores when compared against the pre-test scores for general science knowledge. It can be summarized that using the

MYSains has a significant and positive influence on general science knowledge, with the FCL approach increasing general science knowledge to a higher degree than PBL.

Secondly, after using MYSains, the students did not show any significant change in their understanding of the nature of science when the pre-test and post-test scores are analysed. Students in the PBL group however did show a slight increase in their understanding of the nature of science as evident in the comparison between the pre-test and post-test scores while no change in the pre-test and post-test scores is reflected in the FCL group. Using the MYSains in either a FCL or PBL approach has no significant impact on understanding of the nature of science.

Lastly, after using MYSains, the students did not show any significant improvement in scientific reasoning skills when the pre-test and post-test scores are compared. However, when the cohorts are analysed independently, students in the FCL approach showed a significant increase in scientific reasoning skills as shown in the positive variance between the post-test and pre-test scores than the students in the PBL group. It can be surmised that a FCL approach significantly improves scientific reasoning skills than PBL in using the MYSains.

DISCUSSION

General Science Knowledge

The use of MYSains had a significant effect on student's improvement of general science knowledge overall. Both groups demonstrated a significant gain in their post-test means for general science knowledge which supports the widely held belief by science centre professionals that everyone learns something new when visiting a science centre, in this case, even virtual ones. Although both groups demonstrated significant improvements, the students in the FCL cohort demonstrated a better ability to acquire new general science knowledge as shown by the higher correct responses in the post-test as compared to the PBL group. The findings contend that the use of a FCL approach promotes better acquisition of general science knowledge than PBL, as indicated by the higher mean scores of the FCL group in the post-test measure. Both approaches however demonstrated a significant improvement in general science knowledge scores overall.

This finding is consistent with the literature supporting informal learning, that free-choice is representative of. The reality is that people learn and continue to learn throughout their lives largely on their own account (Falk & Dierking, 2000) which is to say in a free-choice manner. There is strong evidence to suggest that most of what the general public knows about science is the result of various free-choice learning opportunities experienced over time ('Learning in the wild', 2010), including visiting and using virtual science centres. Furthermore, the nature and impact of formal education or more structured learning experiences are largely confined for many to their childhood and adolescent years and even then, at the peak of formal education, guided and structured learning takes up only a fraction of their time (Bransford et al., 2000). Free-choice learning addresses the 'how' of continuing education for individuals who are neither subscribing nor have access to a structured learning programme or experience, such as school or a course.

Science centres and museums have long recognised the value and impact of FCL, approaches which are foundational to the nature of the engagement and experience offered. A science centre experience is often influenced by what an individual likes to see, do, and try. Science centres often just provide the opportunities for various learning engagements whether it be an exhibition hall, an app, a science show, or a family workshop and from these, the individuals self-select the experiences they favour. PBL approaches are also often adopted and built on in certain models of science centre engagement, but the typical and most common visit experience for millions annually at science centres and museums throughout the world and virtually are free-choice ones largely for very practical reasons that it is cost prohibitive to facilitate everyone.

In comparison, PBL approaches in the science centre learning experience is one that is facilitated and in which learners work in social groups towards addressing an ill-structured problem, which can come in the form of a workshop, a method of facilitation by on-floor staff, or in other facilitated situations where the principles of problem-based learning is drawn from and employed.

PBL is often touted as an effective and impactful approach to learning in both the formal and informal context (Araz & Sungur, 2007; Bouwma-Gearhart, Stewart, & Brown, 2009; Gonen & Kocakaya, 2010), and this is evident here as students address the given ill-structured problem which encouraged them to effectively gain new learning through reflection, consideration, and action with a greater degree of responsibility and self motivation (Stepien & Gallagher, 1993). The students in the PBL cohort expressed how they have gained a lot of new science knowledge but oftentimes, the knowledge acquired is specific to the project they are working on. So although the knowledge gain may be extensive and in depth, the breadth and scope of the knowledge is limited

to the ill-structured problem posed. This perhaps suggests why the increase in general science knowledge post-test scores by the problem-based learning cohort is significant but falls below that of the free-choice group.

The approach taken by science centres in presenting content is also an influential factor that supports the findings showing how a FCL approach is more effective in the acquisition of general science knowledge when using MYSains. As FCL offerings like MYSains places the learning responsibility on the learners themselves, the design and development of these offerings place importance in how the learning experiences are curated. For science centres, this takes the form of exhibitions, programmes, or virtual offerings in a way that is compelling, engaging, and more importantly, effective. Falk and Needham (2011) have demonstrated the city-wide impact of the California Science Centre (in the larger Los Angeles metropolis with a population of 10 million) in terms of how visitors acquired and retained science knowledge. The use of innovative exhibit display, in this case a large model of a person with the internal organs shown, helped millions of its visitors learned something new fully on their own accord.

Relating to the social aspect, it was also observed that students in the FCL group were more motivated to explore MYSains on a broader and deeper scale, as compared to students in the PBL cohort. Real time and offline communication tools in MYSains were often used by the students in the FCL group with typical conversations with the facilitator and each other centred on new or interesting science knowledge discovered during the process of using MYSains. Students' interest spanned a wide range of topics, often leaping off from the available topics in MYSains into both convergent and divergent areas relating to the student's personal background, experience, prior knowledge, and interest. This is a clear demonstration of a social constructivist learning environment where there is no teacher but a facilitator and cooperative learning becomes a crucial component of how new knowledge is acquired (Vygotsky, 1986).

In the PBL cohort, students were motivated to address the ill-structured problem and thus less concerned with the pursuit of general science knowledge beyond the topics required in their group work. Students expressed a strong desire to solve the presented problem and thus focused their attention solely on one core topic, for example bats and terminal velocity. So although new science knowledge is acquired to a significant extent, once a topic has been identified, knowledge acquisition becomes centred on one topic but in depth.

In the designed and structured environment of the MYSains virtual science centre, findings show that the FCL approach is more effective for the acquisition of general science knowledge than PBL. The designed and structured approach by science centres imbue their offerings with thoughtful curation, consideration of learning theories and methodologies, and apply approaches designed to optimise impact on learning (Committee on Learning Science in Informal Environments, 2009). Additionally, the FCL environment provides opportunities for students to explore their interests and curiosities, while learning from each other in a social constructivist nature.

Nature of Science

There is no significant difference in the student's understanding of the nature of science in both the FCL and PBL cohorts, as indicated by an analysis of the mean scores in the post-test measure. Although both approaches demonstrated no significant difference in nature of science scores, students in the PBL cohort demonstrated stronger improvement than the FCL cohort as indicated by the increase in correct responses in the post-test. The post-test was administered under supervision after students completed using MYSains in either a FCL or PBL approach.

Nature of science refers to a way of knowing which is expressed through an understanding and an application of science processes. This however is a challenging proposition, particularly for students. The 1996 National Assessment of Educational Progress (NAEP) shows that although most American students in grades 4, 8, and 12 have "some grasp of basic scientific facts and principles by the end of high school, they are not able to apply scientific knowledge to a new situation, design an original experiment, or explain the reasoning behind their answers" (Every Child a Scientist - Achieving Scientific Literacy for All, 1998). So although an understanding of the nature of science is generally viewed as an increasingly necessary learning outcome for science education both formal and informal (Holbrook & Rannikmae, 2009), the ways to remedy this gap is a difficult and challenging one.

Educational syllabuses or systems that value content-acquisition and retention contribute poorly towards a holistic development of scientific literacy (Bao et al., 2009) as scientific literacy is not a reference only to a body of knowledge but also to science processes and the concepts from which science knowledge is derived from (J. Wenning, 2006; Miller, 2002). This content-focused approach has been the bedrock of the Malaysian educational

system for decades (Ministry of Education Malaysia, 2012) although changes for a more holistic and thoughtful approach to formal education has begun as expressed in the Malaysia Education Blueprint 2013-2015. The changes are designed to address the deficiencies associated with content-centric learning, which among other outcomes is a deficient ability in areas such as applying knowledge and reasoning (Ministry of Education Malaysia, 2012) that are core skills necessary for scientific literacy which extends beyond just general science knowledge.

More challenging still, at the knowledge level, Malaysians by and large still perceive themselves as having a poor understanding of science and technology issues (Malaysian Science and Technology Information Centre, 2010). Moreover, recently conducted international student assessments, such as the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) show that Malaysian students rank below the international average in both Mathematics and Science with Malaysia ranking in the bottom third of 74 participating countries (OECD, 2007; Ministry of Education Malaysia, 2012). These assessments encompass not only a student's knowledge base but also application and reasoning skills.

Scientific literacy is not a pre-defined body of knowledge but rather an expressed outcome often culminating in decision making that requires competent science knowledge in relevant fields, an understanding of the nature of science, and finally the ability to interpret and apply scientific reasoning (Halim, 2013; Md Zain, 2013). Therefore, a lack in the ability to apply knowledge and to demonstrate reason hampers student's acquisition of scientific literacy. As the findings of this study suggest, it is relatively easy to improve the acquisition of general science knowledge but beyond that, further successes or visible impact in terms of higher order competence such as understanding the nature of science may only be evident years after effective intervention is introduced.

Although difficult, it is important that scientific literacy gaps in Malaysia are addressed with urgency (Malaysian Science and Technology Information Centre, 2010). The findings suggest that efforts to this end are challenging but not impossible. As nature of science refers to a way of knowing which is expressed through the understanding and application of science processes, Malaysian students would, based on academic assessments, require significant support and guidance to address current deficiencies in learning particularly in science and mathematics.

The success of a PBL approach in both the formal and informal contexts in various studies is quite evident (Araz & Sungur, 2007; Bouwma-Gearhart et al., 2009; Gonen & Kocakaya, 2010) and although the PBL cohort did not show significant improvements in this study, it is worthwile to note that the PBL cohort did show a greater increase in mean scores of nature of science in the post-test as opposed to the FCL group. The guided and facilitated nature of the PBL approach provided certain assurances that students will 'encounter' learning opportunities centric to nature of science, unlike the FCL approach which laid the full responsibility for learning on the student.

In the FCL group, students were encouraged and motivated to use MYSains in various ways as the FCL approach allowed students to freely explore topics that interest them and which they are curious about. The motivation can also be external, mediated by their peers and the facilitator in a socially constructivist approach to learning. As a defining characteristic of FCL is that it is often experienced episodically rather than continuously (Committee on Learning Science in Informal Environments, 2009), the fixed term duration for using the MYSains may simply be inadequate to acquire and retain a higher order learning competency like understanding the nature of science. The knowledge that learners acquire in a FCL approach are often the result of numerous interactions and engagements in the area concerned in varying frequency over time, not in one burst of activity.

It may appear that for nature of science, the PBL approach may be preferred however the gains by the group are small and not statistically significant. It is more appropriate to suggest that the usage of the MYSains in either approach, whether PBL or FCL, have minimal impact on understanding the nature of science. Although concepts and constructs of the nature of science are introduced, the students overall were not able to make use of the learning opportunities presented. The success of improving general science knowledge through using the MYSains suggests that the prevailing position that Malaysian students are skilled and familiar with a content-acquisition model of learning but are challenged to extend the learning into more complex domains such as understanding the nature of science (Ministry of Education Malaysia, 2012) continue to be valid.

Scientific Reasoning

There is no significant difference in the students' scientific reasoning skills between the PBL and FCL groups, as indicated by an analysis of the mean scores in the post-test measure. Although both approaches demonstrated no significant difference in scientific reasoning scores, students overall did record an improvement in post-test mean

scores but with only the FCL cohort posting significant results. The post-test was administered under supervision after students completed using MYSains in either a FCL or PBL approach.

The overall findings are similar to findings observed for nature of science in that the students find it challenging to demonstrate significant gains in higher order competencies beyond knowledge acquisition. Even in the United States of America where scientific literacy levels are higher than Malaysia (Malaysian Science and Technology Information Centre, 2010), students in both Primary and Secondary equivalent grades continue to struggle to apply reasoning in school-based science assessments, being able instead to more easily retain and transfer facts and figures (Every Child a Scientist - Achieving Scientific Literacy for All, 1998). Malaysian students' poor standing in international student assessments, further attest to the general weaknesses of students in the application and reasoning of science (Programme for International Student Assessment (PISA), (2015) & Trends in International Mathematics and Science Study (TIMSS), (2015). Malaysian schools syllabuses that value content-acquisition and retention continue to negatively impact student's ability to apply and reason, and this is an impediment towards effectively improving scientific literacy (Ministry of Education Malaysia, 2012 & Bao et al., 2009).

Scientific reasoning empowers individuals to make sense of the questions they are faced with and to then address them in a scientific way using both scientific knowledge and processes (Sadler, 2004). Scientific reasoning can also be defined as "the cognitive skills necessary to understand and evaluate scientific information, which often involve understanding and evaluating theoretical, statistical, and causal hypotheses" (Bao et al., 2009). Scientific reasoning is simply the ability to distinguish between fact and fiction, followed by the ability to use scientific processes and approach to ultimately evaluate "the credibility, use and misuse of scientific and mathematical information" (Sundre, 2008). Good decision making in problems that science can solve is the primary expression of scientific reasoning skills.

As general science knowledge and an understanding of the nature of science are both essential bedrocks to effective scientific reasoning, the findings of no significant differences between the PBL and FCL groups is expected given similar findings for nature of science. Overall though, scientific reasoning skills in both groups show an increase as evident by the higher post-test mean scores. However only the FCL group show significant results

Science learning in informal settings such as the structured but free-choice environment of informal science learning institutions like the MYSains is more adept at cultivating and nurturing a foundation for scientific reasoning (Committee on Learning Science in Informal Environments, 2009). Unlike the classroom, a FCL approach focuses not only on content gains but on a broader recognition of science learning which constitutes the ability to understand, reason, and decide – elements that are together representative of scientific literacy. In an exam free setting, students in the FCL group were motivated to learn not only more about science knowledge but also its implications. In the social constructivist designed learning environment of MYSains, students were able to connect and converse freely with each other and the facilitator. And in the FCL group, students often broached questions and initiated conversations on the consequences and repercussions of science-related discoveries and decisions made.

A popular topic which many of the students in the FCL group were interested in was on and about the solar system – an anchor category in the MYSains. Students were for example intrigued to learn about the sun, not so much in terms of knowledge and facts which they can easily retrieve but on the implications to daily life. Upon learning that the sun will eventually cease to exist, students were able to reason that this also means that the Earth will also cease to host life. Another example was the discussion on the dwarf planet Pluto. The students knew that Pluto is no longer considered a full planet but not why this is so. After the discussions with the facilitator on how planets are categorized, a student then said that now he can reason why Pluto is considered a dwarf planet and why Pluto was reclassified.

The open-endedness and interest-fueled discussions in the FCL group provided students with the opportunity to ask the 'so-what' questions. This is well aligned with the literature on FCL which describes FCL environments as often being rich in social learning, with interactions whether active or passive being what Vygotsky (1986) describes as 'scaffolds' for learning development. It has also been noted that prior knowledge is often drawn upon in FCL situations (Bamberger & Tal, 2007) as evident in the FCL group. More significantly, given that the average person knows more than what was taught in school, therefore most of what we acquire, understand, and retain are the outcomes of FCL (John Howard Falk & Dierking, 2000) which happens throughout one's life.

Although the PBL cohort did show an increase mean post-test scores, unlike the FCL group, the improvements were not significant. In a PBL environment, learning is promoted and acquired through structured collaboration with peers and interaction with a facilitator towards the resolution of a relevant and meaningful ill-structured problem (Ishii, 2003; Koch, 2005). An Ill-structured problem encourages learners to effectively gain new learning through reflection, consideration, and action but requiring or demanding a greater degree of responsibility and self motivation (Stepien & Gallagher, 1993). When presented with a problem or a topic that students are not necessarily invested in, the level of responsibility and self motivation may be lacking and may hamper learning gains.

The students in the PBL group demonstrated a similar level of commitment and engagement but of a different scale than the FCL group especially in terms of scientific reasoning. For example, the ill structured problem presented required students to expand on new science knowledge discovered and explore the implications that are probably. However, students were caught up largely in the acquisition of general science knowledge and the creative development process of building a blog post. These are familiar skills that students fell back on and although gains across the board were evident including in scientific reasoning, the gains observed are only among a few students who were more motivated and who were engaged with the facilitator.

IMPLICATIONS AND CONCLUSION

The definition of scientific literacy has yet to find a universally accepted solution with complex and varying views in the literature on what scientific literacy entails (Feinstein, 2011; X. Liu, 2009). However, given the importance in measuring scientific literacy, numerous definitions do exist and in the case of the Public Awareness of Science and Technology study done in Malaysia, a more content focused approach is used towards defining and measuring scientific literacy (Malaysian Science and Technology Information Centre, 2010). It is however noted in this study that scientific literacy requires a demonstration of more than just possessing sufficient general science knowledge. An expression of scientific literacy must include an understanding of the nature of science; science as a way of learning and knowing, as opposed to only a body of knowledge. And for all practicalities, scientific literacy is shown to support everyday decision making thus the ability to undertake sound scientific reasoning.

With the rapidly expanding use of digital platforms and technologies, it is inevitable that science centres will go digital in an ever increasing way (Clough, 2013). However, the scale and form of this virtual science centre is uncertain, though often being a duplication and extension of the physical space, recombining and personalising existing learning assets, or interconnecting existing learning assets with expertise for a new experience (Giaccardi, 2006). Given that most science centres and museums first start as a physical space, the virtual space is often dictated by physical properties and norms. This study however shows that a virtual science centre can exist fully on its own without needing a physical counterpart. The central principles and values of informal learning present in museums can be conveyed fully online (J.Jones, 2005).

The setting up and management of a virtual science centre is possible to do without having a physical space however the costs and resources required to maintain and sustain digital ‘operations’ are likely to involve similar requirements as the physical centre. For example, the MYSains has a clear content/topic focus with a defined approach to learning, which all good science centres have. Additionally, the platforms (akin to virtual galleries) do require staffing to be available reliably throughout to respond to queries, fix problems, and keep the social media pages active. Science centres, museums, or institutions keen to embark on a digital learning space like a virtual science centre must be able to dedicate sufficient operational resources to sustain it effectively.

FCL is increasingly recognised as an important contributor to what and how we learn (Falk & Dierking, 2000), with FCL or informal learning often referring to anything and everything outside of the formal education construct in which learners have choice and control over the learning choices (Falk, 2005). This study lends further support by demonstrating how students in FCL approach have higher post-means test scores as compared to the PBL group. More importantly, the evidence points to the positive impact and usefulness of having various FCL opportunities available to students. Although the nature of FCL being episodic and often motivated by self-interests (Committee on Learning Science in Informal Environments, 2009) is at times regarded as being inconsequential to deeper learning, this study has shown that although certain learning gains may indeed be more difficult in this environment, there are overall sufficient positive benefits for FCL to be seriously considered in any educational reforms and when thinking about learning overall.

As a conclusion, in Malaysia the need for addressing scientific literacy may be supported by the easy availability and accessibility of quality and compelling FCL offerings. These approaches not only complement other strategies such as improving science education in the classroom, but is cost-effective, easy to deploy, and can

reach many including adults who often no longer have access to the formal education system. The use of the virtual science centre has been recognised as a viable tool for supporting science learning and sustaining interest in science and also fits well within the push overall for greater utilisation of web-based learning resources in the Malaysia Education Blueprint 2013-2025 (Ministry of Education Malaysia, 2012).

REFERENCES

Allison-Bunnell, S., & Schaller, D. T. (2005). *From the Physical to the Virtual: Bringing Free-choice Science Education Online.* In L. Tan & R. Subramaniam (Eds.), E-Learning and Virtual Science Centres (pp. 163–189). Information Science Publishing.

Araz, G., & Sungur, S. (2007). Effectiveness of problem-based learning on academic performance in genetics. *Biochemistry and Molecular Biology Education, 35*(6), 448–451.

Bamberger, Y., & Tal, T. (2007). Learning in a personal context: Levels of choice in a free choice learning environment in science and natural history museums. *Science Education, 91*(1), 75–95. doi:10.1002/sce.20174

Bao, L., Cai, T., Koenig, K., Fang, K., Han, J., Wang, J., Wu, N. (2009). Learning and Scientific Reasoning. *SCIENCE, 323*, 586–587.

Barnard, L., Lan, W. Y., To, Y. M., Paton, V. O., & Lai, S.-L. (2009). Measuring self-regulation in online and blended learning environments. *The Internet and Higher Education, 12*(1), 1–6.

Barrows, H. S. (1996). *Problem-Based Learning in Medicine and Beyond: A Brief Overview. New Directions for Teaching and Learning.* Retrieved from http://www.eric.ed.gov/ERICWebPortal/detail?accno=EJ535963

Bouwma-Gearhart, J., Stewart, J., & Brown, K. (2009). Student Misapplication of a Gas-like Model to Explain Particle Movement in Heated Solids: Implications for curriculum and instruction towards students' creation and revision of accurate explanatory

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). *How People Learn: Brain, Mind, Experience, and Schoo*l: Expanded Edition. National Academy Press Washington, DC.

Clough, G. W. (2013). *Best of both worlds: museums, libraries, and archives in a digital age.* Retrieved from http://www.si.edu/content/gwc/BestofBothWorldsSmithsonian.pdf

Committee on Learning Science in Informal Environments. (2009). *Learning Science in Informal Environments - People, Places, and Pursuits.* (P. Bell, B. Lewenstein, A. W. Shouse, & M. A. Feder, Eds.). Washington, DC: The National Academies Press.

Every Child a Scientist - Achieving Scientific Literacy for All. (1998). Washington, DC: National Academy Press.

Falk, J. H. (2005). Free-choice environmental learning: framing the discussion. *Environmental Education Research, 11*(3), 265–280.

Falk, J. H., & Dierking, L. D. (2000). *Learning from museums: visitor experiences and the making of meaning.* Rowman & Littlefield.

Falk, J. H., & Needham, M. D. (2011). Measuring the Impact of a Science Center on Its Community. *Journal of Research in Science Teaching, 48*(1), 1–12.

Feinstein, N. (2011). Salvaging science literacy. *Science Education, 95*(1), 168–185.

Giaccardi, E. (2006). Collective Storytelling and Social Creativity in the Virtual Museum: A Case Study. *Design Issues, 22*(3), 29–41.

Goldman, K. H., & Dierking, L. D. (2005). *Free-Choice Learning Research and the Virtual Science Center: Establishing a Research Agenda.* In L. Tan & R. Subramaniam (Eds.), E-Learning and Virtual Science Centres (pp. 28–50). Information Science Publishing.

Gonen, S., & Kocakaya, S. (2010). A Physics Lesson Designed According to 7E Model with the Help of Instructional Technology (Lesson Plan). *Turkish Online Journal of Distance Education, 11*(1), 98–113.

Halim, L. (2013). *Pendidikan Sains dan Pembangunan Masyarakat Berliterasi Sains*. Penerbit Universiti Kebangsaan Malaysia.

Have, P. ten. (1999). *Doing Conversation Analysis: A Practical Guide.* SAGE.

Holbrook, J., & Rannikmae, M. (2009). The Meaning of Scientific Literacy. International *Journal of Environmental & Science Education, 4*(3), 275–288.

Ishii, D. K. (2003). *Constructivist Views of Learning in Science and Mathematics.* ERIC

J. Jones, B. (2005). *Establishing Identification in Virtual Science Museums: Creating Connections and Community.* In L. Tan & R. Subramaniam (Eds.), E-Learning and Virtual Science Centres (pp. 1–27). Information Science Publishing.

J. Wenning, C. (2006). Assessing Nature of Science Literacy as a Component of Scientific Literacy. *Journal of Physics Teacher Education Online, 3*(4), 3–15.

Koch, A. M. (2005). *Knowledge and Social Construction.* Lexington Books.

Lawson, A. E. (1978). The Development and Validation of a Classroom Test for Scientific Reasoning. *Journal of Research in Science Teaching, 15*(1), 11–24.

Learning in the wild. (2010). *Nature, 464*(7290), 813–814.
Malaysian Science and Technology Information Centre. (2010). *The Public Awareness of Science and Technology Malaysia 2008.*
Md Zain, A. N. (2013). *Kongruen Pengajaran Membantu Pelajar Melintasi Sempadan Sains Barat.* Penerbit Universiti Sains Malaysia.
Miller, J. D. (2002). Civic Science Literacy: A Necessity in the 21st Century. *The Journal of the Federation of American Scientists, 55*(1).
Ministry of Education Malaysia. (2012). *Malaysia Education Blueprint 2013 - 2025* (Preliminary Report).
Mocker, D. W., & Spear, G. E. (1982). Lifeling Learning: Formal, Nonformal, Informal, and Self-Directed. *Information Series No. 241* (p. 39). ERIC Clearinghouse on Adult, Career, and Vocational Educaiton, Columbus, Ohio.
National Science Education Standards. (1996). *National Academy Press Washington*, DC.
OECD. (2007). *The Programme for International Student Assessment (PISA)* (p. 56).
Rankin, L. (n.d.). *Lessons Learned: Addressing Common Misconceptions About Inquiry. In Foundations, A monograph for professionals in science, mathematics, and technology education* (Vol. 2, pp. 33–37). National Science Foundation. Retrieved from http://www.nsf.gov/pubs/2000/nsf99148/pdf/nsf99148.pdf
Sadler, T. D. (2004). Informal Reasoning Regarding Socioscientific Issues: A Critical Review of Research. *Journal of Research in Science Teaching, 41*(5), 513–536.
Stepien, W., & Gallagher, S. (1993). Problem-Based Learning: As Authentic As It Gets. *Educational Leadership, 50*(7), 25–28.
Sundre, D. L. (2008). *The Scientific Reasoning Test, Version 9 (SR-9) Test Manual. The Center for Assessment & Research Studies.* Retrieved from http://www.madisonassessment.com/uploads/sr-9_manual_2008.pdf
Torrien, M. (2013). Conversations and Conversation Analysis. In U. Flick (Ed.), The SAGE *Handbook of Qualitative Data Analysis* (pp. 327–340). SAGE.
Vygotsky, L. S. (1986). *Thought and language.* MIT Press.
Yew, E. H. J., & Schmidt, H. G. (2012). What students learn in problem-based learning: a process analysis. *Instructional Science, 40*(2), 371–395.

AN EXPLORATION OF THE USE OF TECHNOLOGY TO ADDRESS ACADEMIC LANGUAGE LEARNING IN TEACHER EDUCATION IN PREPARATION FOR THE EDTPA

Joshua A. Cuevas
Educational Psychologist, Associate Professor
Lumpkin County Middle School PDC Coordinator, College of Education, Middle/Secondary
University of North Georgia
josh.cuevas@ung.edu

L. Roxanne Russell
Emory University

ABSTRACT
This qualitative exploratory research examined the processes student-teachers used to address academic language in lessons generated for middle school instruction. Undergraduate student-teachers were provided access to ReadAhead, a technological platform designed to scaffold students' content literacy skills. The student-teachers were serving year-long internships in four content areas and preparing to complete their edTPA teacher certification portfolios. They planned and implemented lessons within diverse middle school settings. They were subsequently interviewed concerning their thought processes in creating and implementing the lessons, and a document analysis was conducted. The findings indicated that the student-teachers approached the lessons with different purposes in mind, and those divergent purposes influenced other critical aspects of the lessons. They also showed a lack of metacognitive awareness concerning the integration of academic language, though they unconsciously addressed it in ways consistent with the literature and the edTPA's expectations. Ultimately, academic language instruction is essential to learning in all content areas, yet the definitions and application of it may still be unclear to aspiring educators in teacher preparation programs. Considering that the incorporation of academic language instruction will be vital to the licensure process and subsequent practice, it becomes imperative that teacher education programs methodically address the issue.
Keywords*:* academic language, teacher preparation, content literacy, vocabulary, technology, edTPA

Foundations of Academic Language and its New Prevalence in Teacher Training

Academic language has become more of a focus in recent years in the field of education. This is likely in part due to the increasing emphasis on Schema Theory, which asserts that knowledge is organized in the brain in sophisticated, interrelated structures, with all knowledge about a given topic being interconnected in a web-like fashion (Kozminsky & Kozminsky, 2001; Merriam, Caffarella, & Baumgartner, 2007; Tracey & Morrow, 2006). Schema Theory is related to background knowledge, which has been shown to consistently predict and correlate with increased text comprehension, (Dinnel & Glover, 1985; Guthrie, et al., 2006; Kozminsky & Kozminsky, 2001; Snapp & Glover, 1990; Tracey & Morrow, 2006), and text comprehension is essential to learning in all subject areas. The heightened interest in academic language may also be partially attributable to the other dominant theory in education, Vygotsky's sociocultural learning (1986), which stresses the use of language processes as fundamental to all human learning. As colleges of education have emphasized sociocultural learning, activating schema, and building background knowledge with student-teaching candidates and graduate level teachers in order to increase student learning in K-12 classrooms, another entity arose that further propelled the prominence of academic language in teacher training and, in turn, public education- the edTPA or Teacher Performance Assessment.

The edTPA is a product of the Pearson Corporation that was developed by the American Association of Colleges for Teacher Education in conjunction with the Stanford Center for Assessment, Learning, and Equity (SCALE) to assess teacher pedagogical readiness and pedagogical content-knowledge in 27 different content areas (Hildebrandt & Swanson, 2014). It is partially derived from a Constructivist approach which again can be traced back to Schema Theory as hypothesized by Piaget. As of this writing, institutions in 35 states and the District of Columbia are using the edTPA to assess teacher preparation (AACTE, 2016). The authors of one of the first studies conducted on the edTPA since its widespread implementation, Hildebrandt and Swanson (2014) have noted that empirical research is lacking on the edTPA and its impact on teacher preparation programs, teacher outcomes, and student outcomes. While teacher effectiveness is notoriously difficult to gauge, the purpose of the edTPA is to identify beneficial teaching practices and allow teaching interns to demonstrate that they can employ practices and processes that successfully impact student learning. Several criticisms of edTPA have emerged: little is known about how it compares to existing measures of teacher effectiveness and student achievement; corporate encroachment on education and restrictions to academic freedom due to the Pearson Corporation's heavy involvement; and a lack of empirical data supporting its use.

Because most teachers have not been provided with adequate professional learning for addressing academic language in instruction (Gebhard & Willett, 2008), it becomes essential that teacher-education programs implement professional development in the area to better prepare new teachers. By including academic language as a main focus of the edTPA, its creators have ensured that student-teachers concentrate on how to use academic language to scaffold students' learning. But while there appears to be some consensus on how significant the development of academic language is in enhancing students' content knowledge, there are a variety of frameworks for academic language and views on what constitutes it. Due to this ambiguity, many new teachers may lack an understanding of how to incorporate it into their instruction. The purpose of this research was to explore student-teachers' understanding and use of academic language as they used a technological platform designed to focus on academic language in their lesson plans.

Conceptual Frameworks for Academic Language

Regardless of the state of research supporting the edTPA, it is clear that its designers envisioned academic language to be a significant component of the expectations for teaching candidates in their planning and implementation of lessons for the assessment. It thus becomes essential to examine what academic language actually is and how it applies to learning in the classroom. Zwiers (2004), who is cited in edTPA literature, argues that academic language binds tasks, texts, and assessments together and is comprised of words and phrases that "describe content-area knowledge and procedures, express complex thinking processes and abstract concepts, and create cohesion and clarity" in discourse (p. 60). The foundation for academic language instruction combines concepts from language acquisition theory, academic language development, and Constructivist learning models. One essential aspect is to help students interpret meaning via context so that they learn to make concrete-abstract connections and change the concrete meaning of terms in abstract meanings that fit the context of the passage.

Baumann and Graves (2010) examined academic language in its broader context, not in relation to the edTPA. They noted that academic language has also been described in the literature by the following terms: general academic vocabulary, academic literacy, academic background, general academic words, domain knowledge, linguistic knowledge, domain-specific vocabulary, content vocabulary, and academic language skills. They point out that academic language does not necessarily deal with specific content areas or disciplines yet admit that some researchers have classified academic language under the broader category of academic domain knowledge, arguing that domains have their own lexicon and vocabulary. One concern Baumann and Graves introduce is that authors of textbooks and teachers often make the assumption that students know the meanings of general academic vocabulary and only focus on domain-specific vocabulary. Recent models for classifying academic vocabulary have tended to focus on the frequency to which they appear (Fisher & Frey, 2008; Hiebert & Lubliner, 2008), how specialized or technical the terms are (Fisher & Frey, 2008; Harmon, Wood, & Hendrick, 2008; Hiebert & Lubliner, 2008), and how general or widely dispersed terms are across academic disciplines (Fisher & Frey, 2008; Harmon, Wood, & Hendrick, 2008; Hiebert & Lubliner, 2008). The technical or specialized words tend to be important but low frequency while the general terms tend to be found in higher frequency and allow for greater understanding of the more technical terminology.

The study of academic language has more often been associated with ELLs with less research on the subject having been devoted to native speakers (Baumann, & Graves, 2010). Some may question why a concept that has become so prevalent in general education and in teacher training in all areas is predicated upon research stemming from instruction devoted to English language learners. Yet classrooms are increasingly diverse, in many ways, particularly linguistically, culturally, and economically (Gebhard & Willett, 2008), so this development can be seen as a more inclusive approach to education. Indeed, Zwiers (2004) contends that academic language can be viewed as a 3rd language for ELLs or a 2nd one for native speakers. Terms that might be familiar to teachers and some students might be new to others, especially ESL students (Burke, 2004). Those who are familiar with them may take their meanings and the need to teach them for granted, but those who are unfamiliar will lack comprehension of the text when they encounter them. Terms like "argue," "compare," "evaluate," and "claim" have specific academic meanings that students will not necessarily understand intuitively so they must be taught.

Tiered Hierarchical Language Learning and Higher Order Thinking

One useful and well established framework for conceptualizing academic language is Beck, McKeown, and Kucan's (2002) three tier hierarchical model. The first tier is comprised of the most common language used in everyday speech and writing and includes terminology that is prevalent in all subject areas. The second and third tiers can be classified as academic vocabulary, with the second tier being general academic vocabulary and the third being domain specific-vocabulary (Baumann & Graves, 2010; Zwiers, 2007). Tier 2 general academic vocabulary, such as "analysis" or "process", applies across content areas. These terms are used frequently in science, math, and language arts, for instance, but are used less often in everyday discourse so it is important for students to understand them in order to comprehend a wide range of academic information. The term

"metalanguage" might be applicable in many cases to this Tier 2 vocabulary which often refers to a conscious application of cognition or specific language demands. On the other hand, Tier 3 domain-specific vocabulary applies only to certain disciplines, such as "cosine" or "electron", and knowledge of these terms is necessary to allow for deep understanding in specific fields.

Baumann, and Graves (2010) argue that when choosing terms to focus on with students, it is important to consider both Tier 3 *and* Tier 2 words and to have a strong knowledge of students' understanding, including where they might have gaps in their vocabulary in relation to the terms in the text. Teachers most often focus on Tier 3 domain-specific terms, but without an understanding of Tier 2 words, students will have difficulty in applying the Tier 3 content terms that are relatively unique to the various subject areas. Thus, teachers must anticipate not only the Tier 3 words that are essential to the lesson but also the Tier 2 words that act to bridge the Tier 3 words together (Baumann & Graves, 2010; Zwiers, 2007). Both types of terms should be addressed before and during reading and then ideally in speech. If not, students will likely skip the information they cannot comprehend and move on to the information they do, and this will cause gaps in their understanding of the material. Two ways that researchers have suggested that teachers can help students understand how those Tier 2 terms can be used to classify and make sense of the Tier 3 words are through organizers and chunking.

When confronting written text, it is important for both the teacher and student to concentrate on Tier 2 metalanguage that describes thinking skills and higher order processes such as comparing, analyzing, evaluating, synthesizing, and persuading (Zwiers, 2004). Students will generally be exposed to more specific content area language during reading that they will in oral conversation. Then, once they have achieved some mastery of the concepts, students must use this new academic language in formats in which they are required to generate ideas and negotiate meanings for themselves such as in writing and oral discourse, as opposed to only reading or listening. This use of new language to generate ideas brings learning from traditional models based on passive learning in which students receive information to the more active higher order processes of sociocultural learning proposed by Vygotsky (1986).

In one of a limited number of recent empirical studies on academic language, Zwiers (2007) argues that academic language is a dialect that communicates cognitive processes, complex relationships, and abstract concepts. His research focused on the instruction of four 7th grade middle school students who were intermediate English learners who had been in the U.S. for a number of years but whose native language was not English. In contrast to the common three-tier Beck, et al. (2002) framework, Zwiers (2007) found that most language in his observations could be classified into five more sophisticated categories: identifying cause & effect, comparing, persuading, interpretation, and taking others' perspectives. Teachers facilitated thinking in these domains in all four subject areas. However, comparing was more commonly used in history and science, while interpretation was the most common in language arts. Teachers tended to move from closed-ended, fact-based concrete questions at the beginning of lessons to open-ended, higher order, abstract questions deeper into the lessons. The teachers often introduced new terms by linking them to personal experience or background knowledge via examples, analogies, or personifying (asking students to view things through the perspective of whatever they were focusing on). In this way, they promoted learning by activating and building schema. The greatest increases students showed in their discourse were in the areas of comparing and cause and effect. However, a negative pattern emerged that Zwiers called *linguistic enabling* in which teachers allowed students to produce non-academic responses. The teachers also tended to prompt ELL students more with fact-based, closed-ended, lower order questions than they did mainstream students and did not ask for as much elaboration from them, likely in an attempt to protect them from discomfort. Ultimately, teachers must be aware of cognitive skills and the language that accompanies them, and specific training in the use of academic language may be valuable.

Contextual Real-World Learning, Authentic Instruction, and Acquisition

Students will, of course, expand their broader vocabulary through day-to-day communication while being exposed to new terminologies via mediums such as social media. However, educators must actively teach academic vocabulary, which goes beyond terms and encompasses linguistic processes and patterns associated with the content (Wilhelm, 2007). One obvious way to expose students to vocabulary that they might not regularly encounter in their daily lives is to engage them in content area reading. A wide variety of research with students of varying ages has shown a strong relationship between academic vocabulary and comprehension of content (Alfassi, 2004; Beck, Perfetti, & McKeown, 1982; Connor, Morrison, & Petrella, 2004; Joshi, 2005; Ouellette; 2006). While improving vocabulary appears to be crucial to improving comprehension, it is also important to note that language is best learned within meaningful contexts, as opposed to in isolation (Leone et al., 2005; Nelson & Stage, 2007; Wilhelm, 2007).

In order to provide those contextual elements, teachers could create assignments with specific situations that would require the disciplinary language and problem solving that students would encounter in real-world environments through inquiry and connecting the topics to current issues (Wilhelm, 2007). If students are not using the language that experts in the field use, then it is debatable whether they are actually gaining a deep understanding of that subject matter. In order to achieve real learning, a student's thinking should increasingly

approximate that of experts in that field, and the specific language of that field is a reflection of such thinking. Academic language creates a foundation for subsequent forms of discourse appropriate for various fields in the workplace (Zwiers, 2007). Yet listening and/or reading are not enough. Students need opportunities to generate ideas using this new language via talking, writing, reflecting, and creating, both formally and informally (Wilhelm, 2007). Ways of using language may include defining, classifying, analyzing data sets, identifying relationships, or using scientific data to build an argument. Language functions are best learned when applied to specific, purposeful tasks such as these.

Teachers must have students read, write, and discuss academic content using technical language of the field because that language is likely to differ significantly from the language students use in everyday environments (Gebhard & Willett, 2008). Students need to build awareness and metacognition about this type of language, so the discourse must be purposeful and should be a conscious endeavor. Other types of instructional activities that can meet these goals are projects with authentic purpose, a focus on appropriate academic genres for acquiring academic language as well as analysis of those genres and specific language demands, multiple models for explicit instruction, materials that support genre-specific vocabulary building, and tasks that provide opportunities for students to collaborate and reflect. Yet it remains a common misconception that innovative projects cannot conform to standards or that if teachers closely follow standards they cannot incorporate innovative assignments. Because academic language and higher-order thinking skills are so closely linked (Zwiers, 2007), those projects that develop the academic language related to the standards and curriculum should naturally involve students in active, higher-order thinking.

Despite the call for authentic learning activities and language learning in context, there is some evidence that academic language should also be taught in isolation in order to increase students' exposure to it and their metacognitive awareness of it. Acquiring new language and vocabulary is at least partially dependent on the number of times the learner is exposed to the terms and the way those terms are processed (Laufer & Rozovski-Roitblat, 2011). Studies have shown that students can learn new vocabulary from both being exposed to vocabulary incidentally and from focusing on it in isolation. Thus, some researchers have concluded that specific instruction is necessary because it may be unlikely that students are exposed to any term enough times through reading alone to retain its meaning. In a well designed experiment, Laufer and Rozovski-Roitblat found that students learned vocabulary better when they read it in context and the instructor used the context to reexamine the terms than if the students simply read the information without reexamining the terms. However, they learned the terms even better if they studied them through decontexualized practice such as vocabulary exercises or word activities where word learning was the object of the instruction. In either case, when students' consciously focused on word learning, as opposed to purely incidentally encountering them in reading, they retained much more information after only small increases in exposure. In order to directly address academic language learning through increased exposure, Burke (2004) recommends scaffolded instruction, multiple modes of application, graphic organizers, models (examples), generative thinking (using the terminology), clearly structured assignments (in stages), and collaborative exercises.

However, most teachers have not taken part in ample professional learning experiences to prepare them to fully support students' development of academic language, particularly with diverse populations (Gebhard & Willett, 2008). They need professional development in order to become proficient at facilitating student learning of both content and academic language. It is likely that the edTPA certification instrument places a heavy emphasis on academic language for this very reason- to ensure that teachers become adept at focusing on scaffolding students' learning of academic language which in turn should facilitate greater learning in the various content areas.

Ultimately, there seems to be broad agreement on the importance of academic language in learning across the content areas. Yet there are a variety of frameworks, definitions, and perspectives on what constitutes academic language and how it should be taught. This somewhat ill-defined problem can confuse new teachers as to how they should approach instruction in regard to academic language, and out of frustration for lack of a clear understanding of how to incorporate it into instruction they may revert to the age-old method of simply having their students list terms and memorize their definitions. Thus, it becomes essential to explore more nuanced and effective ways to conceptualize academic language and integrate it into lessons so students may use it as a foundation for more extensive learning.

Current Study

This study was designed as exploratory research to examine how undergraduate teaching candidates used and conceptualized academic language when planning and implementing lessons in public middle schools during their field placement internships. They were supplied with a previously validated technological platform that allowed them to present reading passages to students and highlight academic language they deemed appropriate. The teaching candidates were given no direction concerning how to formulate their instruction aside from technology navigation directions, so the creative process they used was of interest. All of the teaching candidates were in the process of completing a mock edTPA portfolio in preparation for undertaking the official

edTPA portfolio within the next several months, so it was expected that the use of academic language would be central to their lesson planning, and the technological platform provided them with a way to narrow their focus on that language. There is very limited previous empirical research on the use of academic language in professional development settings, particularly in regard to the high stakes edTPA, so with this case study we sought to examine the processes associated with how new teachers use academic language and determine what new lines of inquiry may advance future research.

Method

Contextual Factors

The study took place at a large state university of approximately 17,000 students located in the southeastern United States. Ten undergraduate student-teachers volunteered to participate in the research. All were seniors between 21 and 25 years of age, and all were enrolled in an upper level strategies and monitoring course in the college of education designed to engage student-teachers in research-based practices and assessment. Each of them had previously taken and passed a content literacy course that provided them with instruction on how to address reading, vocabulary, and writing development in their specific content areas. The ten student-teachers were in the process of serving year-long internships in local middle schools where they were placed four days per week and were expected to take responsibility for planning and implementing instruction during that time. The middle schools where they served their internships ranged from rural to suburban to urban settings, some of which were composed of mostly White middle school students while others were composed of more diverse populations with English language learners who spoke a variety of foreign languages. The middle schools were located in areas that would be considered as falling into the middle class, lower middle class, and working class ranges of SES. The study took place during the fall of the student-teachers' senior year when they completed a mock edTPA for practice prior to being among the first wave of student-teachers in the state to officially complete the edTPA portfolio during the spring semester of 2016 when they were placed in their internships for 40+ hours each week.

Materials and Measures

Technological platform. Cognitive tools are defined by a number of functions: They are instruments or techniques that enhance cognition, guide cognitive processes, extend intelligence, assist learners in accomplishing complex cognitive tasks, act as intellectual partners with the user, engage the learner, or facilitate critical thinking and higher-order learning (Liu & Bera, 2005). Such cognitive tools act as scaffolding mechanisms. For the purpose of this study, the ReadAhead program, a recently developed technological platform, was chosen as the cognitive tool. An incarnation of the ReadAhead program was previously validated and shown to be effective in scaffolding student learning in two experimental studies (Cuevas, Irving, & Russell, 2014; Cuevas, Russell, & Irving, 2012). A third study illustrated how design decisions were made to optimize the program for classroom instruction in the face of common classroom technology integration constraints (Russell & Cuevas, 2014).

The ReadAhead program allows teachers to choose a passage or text that they would like their students to read. The teacher then cut-and-pastes that selection into the ReadAhead program. The teacher is able to determine how the passage is chunked, or in other words, control how much text is visible to students at any time. Then the teacher has three options for highlighting academic language in the passage: 1) All of the state standards for every grade level and every academic subject area are linked in the program. The teacher can choose this option, and the program will highlight any terms that appear in the passage that are also mentioned anywhere in the state standards for their content area and grade level. 2) The teacher can scroll through the passage and manually choose the academic language to highlight by simply clicking on the terms. 3) The teacher can choose a mixture of the first two options and combine academic language from the state standards with terms identified through their personal judgment.

When students subsequently read the passage, they sit individually at computers or with tablets and view the presentation that the teacher has created for them. Prior to each chunk of text that is presented on the screen, the various terms that the teacher has chosen to focus on flash briefly on the screen, one by one, until the entire chunked passage becomes visible. These "probe words" have the purpose of encouraging students to make predictions about the upcoming chunk of passage, activating schema, and allowing teachers to draw students' attention to important or interesting aspects of the passage. Once the probe words have flashed across the screen, the chunked passage appears with the probe words bolded within it. The students read the chunked passage and then move on by clicking through another set of probe words and another passage, repeating the process until they have read through the entire selection, which may be any length but is most often the equivalent of 3-5 pages or the amount of reading students can be expected to read independently in approximately half a class period. Below in Figures 1 and 2 there is a graphic depicting a probe word displayed and another depicting a chunked passage with the probe words bolded.

Interview procedures. Data were collected in part via two **s**emi-structured group interviews, each lasting approximately our hour. Two student-teachers sat for the first interview, and three student-teachers sat for the second. Four were females and one was male. Of those five student-teachers, one was doing her internship in a middle school math classroom, two were doing theirs in science, and two in language arts. There were several broad topics that were covered, and the student-teachers were encouraged to elaborate. They were prompted with unscripted follow-up and probing questions. The broad topics included the following: how the student-teachers chose the terms they decided to highlight for their students; their purpose in how they approached the lesson; to what extent they considered schema activation, background knowledge, and culture when building the lesson; whether they focused more extensively on Tier 2 or Tier 3 terms; how or if they extended the lesson so that their students would use the terms themselves; whether they planned to remediate or assess students' understanding of the academic language; how their students responded to the task; and how they viewed the process in terms of their edTPA preparation.

Document analysis. Also of interest was whether the student-teachers accurately identified the level of academic language they chose for their students to focus on. In order to analyze this information, we generated lists of the terms that the student-teachers highlighted in their lessons. Then undergraduate students in teacher education who were enrolled in a content literacy course were trained to categorize academic language according to the three tier framework proposed by Beck, McKeown, and Kucan (2002). These student-raters were placed in groups of five by content area and were given a list of terms that corresponded with their content area. For instance, five math education majors were provided with the list of terms one student-teacher had compiled from the passage she used for her math lesson. The student-raters were asked to examine each word as a group and come to a consensus on which tier each term fell into. The criteria they used was that Tier 1 terms were common words that students would be likely to encounter in everyday life, Tier 2 terms were words that students would be most likely to encounter in an academic setting but across a range of different content areas, and Tier 3 terms were words that were specialized terms that were likely only to be encountered within a specific content area.

Procedures

Undergraduate **s**tudent-teachers were recruited from a senior-level strategies and monitoring course during the fall semester of their senior year while they were also completing the first portion of their year-long internship in public schools. Several of the assignments in the course required them to plan out lessons using a lesson plan template that corresponded with the edTPA portfolio. The lessons were required to include research-based strategies that the student-teachers identified through their coursework. The student-teachers searched the university's research database to locate empirical studies that tested learning strategies, and then they built lessons around strategies that were shown to be successful. They were then required to actually implement those lessons in their public school setting with middle grades students and provide evidence that they had taught the lessons in the form of assessment documentation.

One of these assignments required the student-teachers to incorporate technology into the lesson in addition to a research-based strategy. They were offered the use of the ReadAhead program for this assignment because it meets both criteria, as it incorporates technology into the instruction and has been empirically tested and shown to be a successful instructional method (Cuevas, Irving, & Russell, 2014; Cuevas, Russell, & Irving, 2012). Ten student-teachers chose to use the ReadAhead platform in their lessons. They created the lessons themselves based on the edTPA lesson plan template in use by the department, implemented the lessons in their respective schools, collected assessment data on students' learning, and turned the assignment in for a course grade. The ReadAhead presentations the student-teachers used in those lessons became a central source of data collected for this study.

Prior to beginning to plan their lessons, the student-teachers were sent a link to the ReadAhead website. We were interested in the creative process regarding how they would go about using the technology to address academic language in their instruction, so it was important that the professors not dictate how the student-teachers used the program in the lesson. For instance, it might be the case that some of them used the program as a way to have their students focus on and learn the vocabulary, while others might have used it to enhance reading comprehension of the passage, and indeed this turned out to be the case. Thus, they were given no directives in class on how they should format or utilize the program for their presentations. We were also interested in discovering whether the student-teachers had plans to have the students apply the academic language in subsequent lessons and if they intended to assess their understanding of the passages or language. Once the student-teachers went to the website there were basic directions on how to navigate through the program and use it as a tool, such as how to link to their course standards and how to highlight the academic language they chose, but beyond that the direction they chose to take was left up to them.

Approximately six weeks after the student-teachers had completed the assignment they were contacted and asked if they would attend group interviews that would allow us to explore their thought processes in using the program to address academic language in their lessons. We also conducted a document analysis of the terms

in the modules that the student-teachers built to identify the proportions of Tier 1, 2, and 3 words that they highlighted for their students.

Results

Five student-teachers volunteered to sit for two different group interviews, each approximately one hour in duration. Based on the interview notes, a number of categories were identified related to the research questions, and responses from each student-teacher were classified into each of the categories. Once the student-teachers' responses were classified in this way and observations formed, the data were compared to the interview transcripts compiled by a third party from the videotaped interviews in order to assess the accuracy of the observations. Several themes emerged from the interview data: It became clear that the student-teachers had approached the use of academic language in the lessons they created with very different ends and means in mind. They also showed different patterns in whether they used academic language to activate or reinforce background knowledge. It appeared that few of the student-teachers actually considered the edTPA or its perspective on academic language when creating their lessons, which came as a surprise. An innovative application for differentiation also emerged from the process. A document analysis of the terms provided further detail to the findings.

Finding a Purpose: Means to the End

Carla was interning in a math classroom and chose the short narrative for her students to read, *One Grain of Rice: A Mathematical Folktale,* (Demi, 1997). Carla approached the use of academic language in the lesson as a way to scaffold students' understanding of the text, improve their comprehension, and thereby increase their knowledge of mathematical concepts. She reported that the terms she chose to highlight for students were predominantly Tier 2 terms, some that were novel and some that were familiar to students, which emphasized cultural references and math concepts, when applicable. However, while the story applied to exponents, it did not actually use the term *exponents* or many other terms that applied specifically to mathematics. So Carla appeared to view the academic language she emphasized not in terms of vocabulary learning, but as a bridge to connect students' prior knowledge to mathematical concepts. Carla felt that the activity was an inquiry approach with the students using the keywords in a game-like fashion to better comprehend the story but then using inference to make the leap from literature to the math concepts on their own without explicit instruction to do so.

In stark contrast to Carla's approach, Will created his lesson with the goal of building students' vocabulary, with comprehension of the passage as a peripheral objective. Will, who was teaching language arts, chose *The Gift of the Magi* (Henry & Harris, 1969) for his students to read. Will's intention was to highlight difficult terms in the story and to have students focus on them in relative isolation. In particular, he attempted to identify SAT words. He felt that the terms were difficult for his students to define without context and by having them embedded in the reading passage it might provide some context for the students to use to understand the terms. Students essentially were required to use the context of the passage to understand the words. Because the words were from the SAT word list, they were relatively foreign to students and were not meant to relate to ideas that students would have background knowledge about or to personal experiences. Some of the words were necessary to understanding the larger concepts from the passage. Unlike Carla, Will did not use the program in an attempt to get students to predict what would come next in the passage. It was used solely to focus on what he considered to be Tier 3 specialized vocabulary words. However, the lesson did differ from traditional vocabulary instruction in that the students had interpret and infer the meaning of the words from the context so they were required to use higher order thinking as opposed to simply defining and memorizing definitions.

While Carla and Will fell at the opposite ends of the spectrum in regard to how they conceptualized and operationalized the use of academic language in their lessons, the other three student-teachers who were interviewed fell somewhere along the continuum between the two. Mary was interning in a science classroom and chose a passage on the cell cycle from Kids Science World for her students to read. Shonda was also interning in a science classroom and chose two articles on volcano formation, one from Scholastic and one from National Geographic Kids Online as a method of differentiation, which will be discussed presently. Both student-teachers' thought process in creating their lesson was more directed at having their students learn the academic vocabulary than it was on using the program to enhance their comprehension of the text. Yet neither of them used an approach that was quite as concentrated on vocabulary learning as Will did, who chose only those terms that coincided with a list of SAT preparation words. Instead, both chose academic language that was a mixture of terms from the course standards combined with terms they identified as essential to the passages using their own judgment.

Shonda estimated that approximately 70% of the terms she chose came from the course standards, which were available to her in the ReadAhead program, and 30% were chosen based on her opinion on which terms her students would be required to know for assessments or would be essential to promoting future learning. Shonda concluded that the majority of the terms she highlighted for students were comprised of Tier 3

nouns. Mary, like Shonda, also used vocabulary learning as the focus of her lesson. When building her slideshow, Mary examined the course standards the program linked to, words that applied to the standards, and the textbook in order to choose the terms to be highlighted. She estimated that 20% of the terms she chose were from the standards or text and 80% were based on terms she identified that were essential to the unit she was covering. So while she meticulously combed through the standards, Mary created her list of terms predominantly based on her professional judgment. The terms, like those of Shonda, were judged to be mostly Tier 3 nouns, some of which her students had been exposed to previously.

Angie, the fifth student-teacher who took part in the interviews, used a blended approach that took both vocabulary learning and enhancing comprehension into account when creating her lesson. She was teaching in a language arts classroom and chose to use an article on Jesse Owens that she found online because the class had discussed Jesse Owens previously during a unit on the Holocaust. Angie reported that she chose mostly Tier 3 terms, in her estimation, that were specific to the time period, words the students had been exposed to previously, and words to create interest. For the words highlighted to create interest, she, like Carla, specifically wanted students to use them to predict what was to come. While she believed that most of the terms were Tier 3 nouns, Angie did use some verbs for the terms highlighted to create interest such as "fought". She checked the words from the ReadAhead list of course standards but chose not to use them and instead highlighted only the words she chose based on her own judgment.

Schema Activation and Background Knowledge

One of the theoretical attributes of the ReadAhead program was that it is meant to encourage students to make predictions when they view the probe words prior to reading each chunked section, though the student-teachers were unaware of this. It was interesting to find that two of them, Carla and Angie, specifically identified this function and created their lesson with the thought in mind that the terms they chose would stimulate their students to generate predictions. Concepts that are related to generating predictions are schema activation and building background knowledge because if students have substantial schemata in place and extensive background knowledge, they may be more likely to make accurate predictions concerning the upcoming text.

So one of the questions we posed was whether the student-teachers consciously considered schema activation and reinforcing background when creating their lessons. We found that of the three student-teachers who had predominantly focused on building vocabulary in their lessons, none of them considered how the terms may lay the foundation for background knowledge as they constructed their lessons. In retrospect this in unsurprising because they approached the lessons as a way to use text to narrow the students' attention down to specific terms, not as a way to assist them to understand the larger concepts inherent in the passage. In other words, they used an analytical process rather than one of synthesis.

However, the two students whose purpose in creating the lesson was to assist in enhancing comprehension of the whole did envision the activation of background knowledge to be central to their task. The story that Carla chose for her students dealt with rice farming in Asia. While she did not believe that most of her students would have extensive background knowledge of Asian cultures, they were largely from rural areas where farms were plentiful so they should have had schemata in place regarding farming. Carla saw their background knowledge of farming as a way to bridge the gap to their understanding of Asian culture, and ultimately to the math concepts that were at the heart of the passage. Therefore, she sought to address students' background knowledge by highlighting terms associated with rice farming that were specific to the Asian culture depicted in the story. Upon reflection, Carla indicated that she felt that because she was able to stimulate students' schema and they were able to sample what was coming next, it made reading the passage less frustrating and less intimidating for them than would otherwise have been the case and ultimately did lead to increased comprehension.

Like Carla, Angie also considered background knowledge when constructing her assignment. Her class had previously completed a unit on the Holocaust during which they covered Jesse Owens' involvement as a Black athlete and gold medal winner at the 1936 Olympic Games in Berlin. So Angie chose the reading selection on Jesse Owens specifically because she knew students already had a foundation of background knowledge on the subject. Therefore, when she identified terms in the text that would be previewed for students, she chose terms that were specific to the time period, some that they had been exposed to previously that had already been assimilated into their schema for the subject, and others that would capture their attention. And, like Carla, she intended for the terms to activate her students' schemata so they would make predictions about the upcoming chunks of text and improve their comprehension of the passage.

Conforming to the edTPA: Using and Assessing Academic Language

One area of interest in examining the student-teachers' approach to academic language was to ascertain how deliberate they were in using their lessons to address the development and assessment of academic language as it is pertains to the edTPA, in terms of function, demand, syntax, and discourse. As noted previously, they were not explicitly instructed to use the program for that purpose. To our surprise none of the teaching

candidates reported considering the edTPA or academic language at all as it applies to the portfolio, despite the fact that they were documenting their lessons on a template explicitly modeled on the edTPA and they were in the process of compiling a mock edTPA in preparation for completing the live version of the certification instrument the following semester. This seemed to suggest that the use of academic language had not become second nature to the student-teachers and they may have been addressing it in their edTPA portfolios superficially, as a way to meet the requirements of the assessment, but not as a core practice.

While none of the student-teachers revealed a metacognitive awareness of employing or building upon academic language as it pertains to the edTPA, it was still of interest whether any of them had unknowingly integrated it into their planning. Did they specifically consider Tier 2 terms such as *analyze* or *evaluate* that would act to bridge students' understanding and allow them to access meanings of domain-specific Tier 3 terms? Had they gone beyond using the RA program as a way to simply introduce vocabulary and affect comprehension of the text and considered extending the lesson so that their students would apply the terms themselves? Did they plan to remediate or assess students' understanding of the academic language?

As previously noted, the student-teachers reported focusing predominantly on what they believed to be Tier 3 terms. None of them indicated that they had intentionally highlighted terms related to cognitive skills or higher order processes central to edTPA academic language such as such as comparing, analyzing, applying, evaluating, synthesizing, and persuading. This, of course, was likely a function of those terms not being prevalent in the passages that they chose for their students. All of the student-teachers did, however, either include a during-reading accountability measure requiring their students to engage with the academic language or extend the lesson post-reading in order have their students more actively utilize the language and concepts.

For an accountability measure, Shonda had her students complete a double entry journal while they read the selection. She was surprised to find that on the left side of the page, while her students were able to successfully document explicit evidence from the text and often used the terms she highlighted in RA for this aspect, they were far less successful in constructing in-depth reflections or making implicit connections on the right side of the page. This would suggest that the students were engaged in the lower order processes involved with surface level observations yet struggled with the critical thinking and more advanced reasoning skills that would allow them to synthesize or interpret to create deeper meaning.

Will, like Shonda, employed a during-reading accountability measure. It was an organizer listing the probe words from the passage which were the SAT terms he had identified. His students were tasked with providing definitions for the words by using context clues from the passage as they read. While listing definitions would only require lower level thought processes in most cases, because students had to use inference to extract meaning from the context of the passage, the activity did clearly introduce elements of active reasoning. Will concluded in hindsight, however, that the accountability measure and the isolated focus on specific SAT terms actually impeded comprehension because it drew students' attention away from fluent reading.

Three of the student-teachers utilized post-reading extension activities. Carla administered a subsequent assessment that was based on the story selection and referenced the main character's situation. It required students to apply their learning to a new and somewhat different situation. This would be an example not only of application, but also of complex transfer skills that would encompass a variety of higher order processes. Likewise, Angie created an assignment for which her students were later expected to use the probe words that she highlighted in the program. Her students were asked to write a narrative paragraph in which they included the highlighted terms from the RA presentation applied correctly in context which again would involve skills such as evaluation and synthesis. Mary implemented a posttest on which students were required to provide definitions for the terms from the passage that she had selected as probe words. This was a lower order task that would draw on memory rather than active reasoning and would not resemble the application of academic language as depicted in research and the edTPA framework. However, Mary also employed s second assessment that asked students to apply the terms in various situations she presented to them in much the same way that Carla and Angie did, and this did introduce elements of higher order thinking.

So in terms of the student-teachers addressing academic language as it is conceptualized by the edTPA, the results were nuanced and somewhat mixed. None of the student-teachers consciously or intentionally directed their lessons towards building upon their students' understanding of academic language despite the fact that the RA program was particularly well suited for concentrating on it. None of them would have been likely to document the inclusion of academic language in their edTPA portfolios or to provide an explanation of its use in the heavily weighted rationale sections. Yet each of them did actually address academic language in a way that went beyond the most traditional and typical forms of vocabulary learning, which commonly entail little more than the memorization of Tier 3 terms and their definitions. Each of the student-teachers incorporated an extension activity that required their students to use higher order thought processes and apply their understanding in some way. Thus, while it appears the student-teachers had not yet developed the metacognitive awareness that would allow them to be cognizant of using academic language to scaffold their students' learning, they seemed

to fall back on their previous training by including student-centered tasks that served to increase engagement and stimulate students' use of academic language central to the content.

Differentiation

While differentiation was not a primary focus of this research at the outset, we felt the need to include a section on it in order to detail what we view as one student-teacher's innovative and resourceful use of the RA program to differentiate her lesson. Shonda identified two articles focusing on volcanoes, the content matter that she was covering with students in the course of the unit. She concluded that one, the article from Scholastic, was better suited to her more advanced readers and the other, from Nat Geo Kids Online, was more well-suited for the less advanced readers, including a number of ELL students. She used the Flesch-Kincaid grade level indicator in Word to ascertain the reading level of each passage. Surprisingly, the article she felt was more challenging actually was rated as being written at a lower reading level than the other by the Flesch-Kincaid indicator, but she used it the way she originally intended and reported that the more advanced readers did find the passage to be challenging regardless of its lower rating.

For the passage intended for the less advanced readers, Shonda generated three different presentations. In addition to the original English version of the article, she used a translator function to create one version in Spanish and another in Vietnamese. So for this particular lesson, there were four different presentations based on the two original articles that were available to her students- one in English for the more advanced readers, one in English for the less advanced readers, one in Spanish, and one in Vietnamese. The same probe words were used for each version, so while the students read the passage in the language they were most comfortable with, they all were prompted to focus their attention on the same scientific concepts. Shonda essentially used the RA program to create very complex differentiation with one high level passage and one low level passage in three different languages.

Document Analysis

Four groups of five student-raters evaluated each list of terms the student-teachers had created within their lessons in order to identify which tier each term fell into. The student-raters only analyzed terms that were within their own content areas and were unaware of how the student-teachers had classified the terms. The student-raters examined each term as a group and reached a consensus on the outcome. Below in Table 1 you will find the results of the student-raters' analysis.

Table 1: *Tiered Words*

Student-Teacher	#words	Tier 1% (*N*)	Tier 2% (*N*)	Tier 3% (*N*)
Carla (Math)	54	59.3% (32)	37% (20)	3.7% (2)
Angie (ELA)	24	54.2% (13)	37.5% (9)	8.3% (2)
Shonda (Science)	20 (low level)	15% (3)	40% (8)	45% (9)
Shonda (Science)	19 (high level)	26.3% (5)	26.3% (5)	47.4% (9)
Mary (Science)	14	0% (0)	0% (0)	100% (14)
Will (ELA)	13	0% (0)	30.8% (4)	69.2% (9)

Upon examining the results of the student-raters assessment, a number of trends emerged. First, Carla and Angie embedded the most terms in the reading assignment, 54 and 24 respectively. These were the two student-teachers whose purpose in constructing the assignment was focused most closely on using it to enhance their students' comprehension of the text. Shonda, Mary, and Will, who reported that their primary purpose was extending students' vocabulary, embedded fewer terms, 20, 19, 14, and 13 respectively. Will, whose lesson was the most narrowly focused on vocabulary of any of the five student-teachers, embedded the fewest words, only 13. In terms of absolute numbers, this resembled traditional vocabulary instruction during which a class may define and study 10 words per week.

The next trend was found in the percentage of terms that fell into the respective categories. Again, the student-teachers whose purpose was in enhancing comprehension showed a different pattern from those whose purpose was focused on vocabulary learning. Carla and Angie highlighted the greatest percentage of Tier 1 terms by far (59.3% and 54.2% respectively), as well as the least Tier 3 terms (3.7% and 8.3%). Indeed, more than half of the terms highlighted by each of these student-teachers was a Tier 1 term that students would be exposed to in daily life. As they reported, their intention was to stimulate students' interest in the passage, encourage them to make predictions, and urge them to make connections between ideas in order to improve comprehension. Thus, with this focus, Tier 3 terms may have been less essential in meeting their desired ends.

The other three student-teachers, Shonda, Mary, and Will, who were to some degree more concerned with vocabulary learning, highlighted fewer Tier 1 terms (15%, 26.3%, 0%, and 0% respectively), with two of them highlighting no Tier 1 terms at all. They also embedded a much higher percentage of Tier 3 terms (45%, 47.4%, 100%, and 69.2%), and in Mary's case all of the terms she chose were Tier 3. One explanation for this

could be a function of the content area. Both Shonda and Mary were teaching science, so they might have felt that the terms that were specialized to the content would be more beneficial to the curricular unit and future learning than general comprehension of the passage. And because Will was concerned with having his students learn SAT words, he mostly chose terms that fell into the Tier 3 category.

The differences between Tier 2 terms were less pronounced, with most of the assignments falling between 26.3% and 40% in that category (37%, 37.5%, 40%, 26.3%, and 30.8%). The exception was Mary, who chose no Tier 2 terms (0%) and limited her assignment's focus to only Tier 3 terms. The relatively uniform choice of Tier 2 terms may be seen as being consistent with the definition of academic language portrayed in the research literature and edTPA-related literature because it is the Tier 2 academic terms that bind the more complex words together and are necessary for more thorough comprehension. A focus on these Tier 2 terms also shows a divergence from traditional vocabulary instruction that has tended to emphasize only a brief list of Tier 3 specialized words and their corresponding definitions.

Also of interest was whether the student-teachers had correctly categorized the terms they chose. During the interview process they were asked which tier they had focused their assignment on, though they were not asked to classify each term individually. Thus, each student-teacher provided an approximation of which tier most of the chosen terms had fallen into, and we were able to compare their conclusions to those of the student-raters who analyzed the documents. Carla reported that the terms she chose to highlight were predominantly Tier 2 terms. Yet the raters found that while she had indeed included many Tier 2 terms (37%), the vast majority of the terms she chose were Tier 1 words (59.3%). Angie stated that she had selected mostly Tier 3 nouns. However, she actually chose very few Tier 3 terms (8.3%) and instead emphasized Tier 1 terms the most (54.2%). This suggests that she did not have a clear understanding of how to classify the terms and also implies that it was unlikely that she had considered the different levels of academic language when constructing the assignment.

Shonda concluded that her assignment revolved around the acquisition of Tier 3 nouns. This proved to be accurate, as the assignment she created for her lower level readers contained 45% Tier 3 terms and the one created for the higher level readers contained 47.4% Tier 3 terms (both pluralities), combined with 40% and 26.3% Tier 2 terms, respectively. Curiously, the assignment for the higher level readers actually contained more Tier 1 terms (26.3%) than the one for the lower level readers (15%). So while Shonda was more successful in identifying the classifications of the terms she chose, it appears that the lower level readers may have been exposed to more sophisticated terminology, with 85% of the terms being either Tier 2 or Tier 3, while the higher level readers only encountered 73.7% of the words at one of those two levels. Of the two students who used the assignment with the greatest intention of building vocabulary, Will and Mary both indicated they focused almost exclusively on Tier 3 terms. This did indeed turn out to be the case, with Will's assignment being comprised of 69.2% and Mary's being 100% at the Tier 3 level.

Based on this portion of the analysis it appears that the student-teachers who used the assignment to focus on vocabulary had a clearer understanding of where their chosen terms fell on the continuum of tiered academic language. They were much more likely to choose terms that would be classified in the two higher levels combined, as general academic language (Tier 2) and content-specific academic language (Tier 3). The student-teachers whose purpose was to enhance comprehension of the text were much more likely to choose common language that students would encounter in their daily lives (Tier 1). This is reasonable considering that they were attempting to highlight terms that would capture students' interest and cause them to generate predictions, and common terms may be more likely to serve that purpose. However, it also suggests that they were unaware of the level of complexity of the terms they chose or how likely they were to be related to general academic language or content-specific language.

Discussion

The purpose of this exploratory research was to observe how undergraduate teaching candidates used academic language in the planning and implementation of lessons when they were provided with a cognitive tool, the ReadAhead program, that was designed to assist teachers in scaffolding students' content literacy development. The student-teachers had previously completed a course on content literacy instruction within their disciplines and were in the midst of their internships, preparing to complete their edTPA portfolio assessments. Because the use of academic language is central to the edTPA certification instrument, this study allowed us to examine not only the process the aspiring teachers used, but also how cognizant they were in systematically addressing academic language in their instruction.

The student-teachers were not given directives on how they should use the ReadAhead program so they were free to integrate it into their lessons any way they saw fit. This led to them using the program and implementing their lessons with very different purposes in mind. Two of the student-teachers decided to use the program to enhance students' comprehension of the passages they chose for them to read. Two others chose to use the program primarily to focus on certain vocabulary within the passages in order to assist students in expanding their understanding of the academic language, with comprehension being a peripheral goal. The fifth

student-teacher acknowledged that she had both purposes in mind, vocabulary building and comprehension, though vocabulary learning was the primary goal.

We found that the purpose that each student-teacher had in constructing his or her lesson influenced other aspects of the lesson in important ways. For example, the two student-teachers whose main goal was to enhance their students' reading comprehension reported that they chose terms to highlight for the specific purpose of activating schema and addressing students' background knowledge. This is considered a best-practice in regard to reading development (Cuevas, Irving, & Russell, 2014; Cuevas, Russell, & Irving, 2012; Dinnel & Glover, 1985; Guthrie, et al., 2006; Kozminsky & Kozminsky, 2001; Snapp & Glover, 1990; Tracey & Morrow, 2006), and it coincides with the current understanding of academic language as defined within the literature base (Wilhelm, 2007; Zwiers, 2004; Zwiers, 2007). These two student-teachers did not limit the academic language they chose to Tier 3 words that were specialized to their content area, but instead chose terms that could tie intricate meanings together and would encourage active cognitive processes such as prediction and inference.

In contrast, the student-teachers who focused on vocabulary building as the goal of their lessons did not consider schema activation or prior knowledge when planning their lessons. Their purpose was to have their students use context clues to learn the meaning of Tier 3 terms rather than to assist the students in comprehending the meaning in the passage. This seemed to be consistent with more traditional models of instruction that focused on building vocabulary with the intention of improving comprehension over time (Alfassi, 2004; Beck, Perfetti, & McKeown, 1982; Connor, Morrison, & Petrella, 2004; Joshi, 2005; Ouellette; 2006). Thus, the student-teachers in this group were not concerned with having students synthesize the intricate parts to come to a deeper understanding of the whole, and instead took an analytical approach that required students to extract narrow meanings of the terms from isolated portions of the text.

The student-teachers' chosen purpose also appeared to affect other attributes of the lesson as it related to academic language. The two student-teachers whose goal was to improve students' comprehension chose far more terms to highlight in their presentations, yet those terms were much more likely to be common words (Tier 1) or general academic language (Tier 2). This was consistent with their desire to stimulate students' thinking and have them construct meaning by considering the terms they would have already been familiar with, as proposed by Baumann, and Graves (2010) and Zwiers (2004; 2007). The student-teachers whose goal was to build students' vocabulary showed exactly the opposite trend. They chose far fewer words to highlight, and the terms they did highlight were much more likely to be specialized, content-specific vocabulary (Tier 3). This served the purpose of having their students focus their attention on a limited number of difficult words in the hope that reading them in context would help them to retain the meaning of the individual words.

One surprising finding was the student-teachers' lack of metacognition, or lack of a conscious attempt to address academic language in their lessons, even though they planned the lesson using an edTPA-aligned template that emphasized the integration of academic language and the fact that the ReadAhead program was particularly well suited to focusing on academic language. None of the five student-teachers reported that they thought of the presentation they created for their students in terms of academic language. None of them reported that they consciously considered academic language in regard to how their students would actively use the language later or display mastery of the concepts. The student-teachers did not at all contemplate the four domains of academic language essential to the edTPA- discourse, demand, function, or syntax. Yet, when they were pressed concerning extension activities and assessments, it became clear that all of them later did incorporate active learning practices involving the language from these lessons in a way that certainly would qualify as meeting the criteria for academic language as defined by the edTPA. This suggests that their prior training was effective in helping guide the student-teachers to include student-centered, active learning in their instruction and in extending their lessons to require their students to become involved in higher order thought processes. But, interestingly, they appeared to be unaware they were doing so and would not have elaborated on this in the crucial rationale section of the edTPA portfolio.

Similarly, even though all of the student-teachers had successfully completed a content literacy course, most of them did not show a great deal of accuracy in identifying the levels of vocabulary that they focused on in their lessons. All but one overestimated the specificity of the terms they chose. The two student-teachers who emphasized reading comprehension estimated that they had chosen mostly Tier 2 and Tier 3 terms when in fact they had chosen mostly Tier 1 terms. Those student-teachers whose purpose was in vocabulary building were more accurate in identifying the levels of the terms they chose, though two of them also tended to overestimate the complexity of those terms. The fact that they did not consider academic language when planning their lessons and that they had difficulty identifying the correct tiers of the terms they chose suggests that they were not deliberate in how they applied academic language within their lessons and that the success of the lessons, in terms of academic language, may have been a result of previous training rather than conscious effort.

The most interesting use of the ReadAhead program was more a function of the student-teacher's creative lesson planning than it was a concentrated effort to address academic language as defined by the literature. She was able to differentiate her reading assignment by using two different science passages and translating what she determined to be the lower level passage into two different languages in addition to English.

She effectively created four different reading assignments in three different languages, all of which emphasized similar academic language. Without the use of such technology this type of differentiation would not have been possible without a very lengthy planning process, one that would not be practical for teachers struggling with the day-to-day time constraints associated with the varied responsibilities of teaching. Yet this student-teacher was able to efficiently address content knowledge and academic language for both high and low level readers in addition to meeting the linguistic needs of ELL students without allowing them to fall behind in terms of science content.

Conclusions, Limitations, and Future Research

The most interesting findings of this study were the differing ways in which the student-teachers approached their lesson creation and how the purpose they had in mind influenced subsequent aspects of their lessons. For instance, those student-teachers whose goal was improving reading comprehension highlighted many more terms for their students, and those terms were more likely to be common Tier 1 and Tier 2 terms. Thus, they required their students to draw upon background knowledge and use the process of synthesis as they read. In contrast, those who focused on vocabulary building highlighted far fewer terms, and those terms were more likely to be more sophisticated Tier 3 content-specific vocabulary. Their students were required to use an analytic approach and draw from the surrounding context to establish narrower meanings.

One curious finding was that the student-teachers showed little metacognition in regard to integrating academic language into their lessons, yet incorporated extension activities that compelled their students to apply the terms using higher order thinking processes. This suggests that the previous content literacy course they had taken was effective in training them to actively engage their students in developing academic language and domain specific vocabulary. They essentially did what they were taught to do by extending the lesson to include student-centered tasks that promoted active cognitive processing. But it also suggests that the student-teachers had a limited understanding of the expectations of the edTPA. The concept of academic language and its importance to lesson implementation seemed to remain a vague one. Some might argue that this could be remedied by weaving more explicit instruction regarding the use of academic language and how it applies to the edTPA into education courses such as the content literacy courses offered. Yet this might be construed as "teaching to the test" with professors showing student-teachers how to pass without the candidates developing understanding for themselves.

The study was somewhat limited by the small sample size. The results certainly cannot be generalized to other cohorts of student-teachers who might be going though similar experiences at other universities. However, it may be instructive to other educators to examine the process these student-teachers used and the outcomes of that process. It is likely that teaching candidates at other universities would similarly have a less than crystallized understanding of academic language and the most effective ways to address it within the context of newly created lessons, in addition to having vague notions about what is expected in that regard on the edTPA certification test.

Another limitation is that there was no way to measure the outcome of the instruction in terms of the middle school students' learning. It would be interesting to identify whether the students whose activities focused on comprehension building showed inferior or superior learning outcomes to those whose activities focused on vocabulary building. Of course, this would have required a much larger sample size and a much more complex research design. Our purpose was to examine the student-teachers' processes in addressing academic language, but future research could shift that focus to student outcomes.

There is strong consensus in the field of education that academic language is essential to current and future learning outcomes. Each content area has domain-specific terminology that students must master in order to build expertise in the field. Yet there is also academic terminology that is used consistently across domains, and this form of academic language has too often been left unaddressed as teachers assumed that students would have already mastered the terms that describe thought processes and bind the content-specific vocabulary together. These issues have come to the forefront in recent years and have started to become a staple of teacher education programs, as well as central components of teacher certification instruments such as the edTPA. But much of the field remains undeveloped, and there is limited consensus regarding the definitions involved, much less how practice should reflect these constructs.

Teacher preparation programs must continue to methodically address the issue of integrating academic language into instruction because it is likely that many aspiring teachers, like those who participated in this research, continue to have a limited understanding of the processes involved. The subject of academic language will not only influence the licensure of new teachers but also the quality of learning that their students experience through the years. Ultimately, exploratory research such as this should be followed by larger scale experimental studies that track student outcomes in order to help us better understand how students respond to a variety of instructional approaches and how academic language may be used to address the needs of a variety of learners.

References

Alfassi, M. (2004). Reading to learn: Effects of combined strategy instruction on high school students. *Journal of Educational Research, 97*(4), 171-184.

American Association of Colleges for Teacher Education. (2016). *About edTPA: Overview*. Retrieved from http://edtpa.aacte.org/about-edtpa

Baumann, J. F., & Graves, M. F. (2010). What is academic vocabulary? *Journal of Adolescent & Adult Literacy, 54*, 4-12.

Beck, I.L., McKeown, M.G., & Kucan, L. (2002). *Bringing words to life: Robust vocabulary instruction*. New York: Guilford.

Beck, I. L., Perfetti, C. A., & McKeown, M. G. (1982). Effects of long-term vocabulary instruction on lexical access and reading comprehension. *Journal of Educational Psychology, 74*(4), 506-521.

Burke, J. (2004). Learning the language of academic study. *Voices From the Middle, 11*(4), 37-42.

Connor, C. M., Morrison, F.J., & Petrella, J.N., (2004). Effective reading comprehension instruction: Examining child x instruction interactions. *Journal of Educational Psychology, 96*(4), 682-698.

Cuevas, J. A., Irving, M. A. & Russell, L. R. (2014). Applied cognition: Testing the effects of independent silent reading on secondary students' achievement and attribution. *Reading Psychology*. *35*(2). 127-59. doi: 10.1080/02702711.2012.675419.

Cuevas, J. A., Russell, L. R., & Irving, M. A. (2012). An examination of the effect of customized reading modules on diverse secondary students' reading comprehension and motivation. *Educational Technology Research & Development, 60*(3), 445-467. doi: 10.1007/s11423-012-9244-7.

Demi. (1997). *One grain of rice: A mathematical folktale*. New York: Scholastic Press.

Dinnel, D., & Glover, J. A. (1985). Advance organizers: Encoding manipulations. *Journal of Educational Psychology, 77*(5), 514-521.

Fisher, D., & Frey, N. (2008). *Word wise and content rich: Five essential steps to teaching academic vocabulary*. Portsmouth, NH: Heinemann

Gebhard, M. & Willett, J. (2008). Social to academic. University-school district partnership helps teachers broaden students' language skills. *Journal of Staff Development, 29*(1), 41-45.

Guthrie, J. T., Wigfield, A., Humenick, N. M., Perencevich, K. C., Taboada, A., & Barbosa, P. (2006). Influences of stimulating tasks on reading motivation and comprehension, *Journal of Educational Research, 99*(4), 232-245.

Harmon, J.M., Wood, K.D., & Hedrick, W.B. (2008). Vocabulary instruction in middle and secondary content classrooms: Understandings and direction from research. In A.E. Farstrup & S.J. Samuels (Eds.), *What research has to say about vocabulary instruction* (pp. 150–181). Newark, DE: International Reading Association.

Henry, O., & Harris, J. (1969). *The gift of the Magi, and other O. Henry stories*. New York: Caedmon.

Hiebert, E.H., & Lubliner, S. (2008). The nature, learning, and instruction of general academic vocabulary. In A.E. Farstrup & S.J. Samuels (Eds.), *What research has to say about vocabulary instruction* (pp. 106–129). Newark, DE: International Reading Association.

Hildebrandt, S. A., & Swanson, P. (2014). World language teacher candidate performance on edTPA: An exploratory study. *Foreign Language Annals, 47*(4), 576-591. DOI: 10.111/flan.12117

Joshi, R. M. (2005). Vocabulary: A critical component of comprehension. *Reading & Writing Quarterly, 21*(3), 209-219.

Kozminsky, E. & Kozminsky, L. (2001). How do general knowledge and reading strategies ability relate to reading comprehension of high school students at different educational levels? *Journal of Research in Reading*. *24*(2), 187-204.

Laufer, B., & Rozovski-Roitblat, B. (2011). Incidental vocabulary acquisition: The effects of task type, word occurrence, and their combination. *Language Teaching Research, 15*(4), 391 – 411.

Leone, P. E., Krezmien, M., Mason, L., & Meisel, S. M. (2005). Organizing and delivering empirically based literacy instruction to incarcerated youth. *Exceptionality, 13*(2), 89-102.

Liu, M., & Bera, S. (2005). An analysis of cognitive tool use patterns in a hypermedia learning environment. *Educational Technology Research and Development, 53*(1), 5-21.

Merriam, S., Caffarella, R., Baumgartner. (2007). *Learning in adulthood*. San Francisco: John Wiley & Sons.

Nelson, J. R., & Stage, S. A. (2007). Fostering the development of vocabulary knowledge and reading comprehension though contextually-based multiple meaning vocabulary instruction. *Education & Treatment of Children, 30*(1), 1-22.

Ouellette, G. P. (2006). What's meaning got to do with it: The role of vocabulary in word reading and reading comprehension. *Journal of Educational Psychology, 98*(3), 554-566.

Russell, L. R. & Cuevas, J. A. (2014). Designing customizable reading modules for a high school literature classroom. *Tech Trends*, *58*(5). 70-79. doi: 10.1007/s11528-014-0788-8.

Snapp, J. C., & Glover, J. A. (1990). Advance organizers and study questions. *Journal of Educational Research, 83*(5), 266-271.
Tracey, D., & Morrow, L.M. (2006). *Lenses on reading*. New York: Guilford Press.
Vygotsky, L. (1986). *Thought and language*. Cambridge: MIT Press.
Wilhelm, J. D. (2007). Imagining a new kind of self; Academic language, identity, and content area learning. *Voices From the Middle, 15*(1), 44-45.
Zwiers, J. (2004). The third language of academic English. *Educational Leadership, 62*(4), 60-63.
Zwiers, J. (2007). Teacher practices and perspectives for developing academic language. *International Journal of Applied Linguistics, 17*(1), 93–116.

Declarations
This research included no financial or non-financial competing interests and no outside funding was involved.

ASSESSING MULTIPLE INTELLIGENCES (MI) THROUGH THE SOUTH AFRICAN CURRICULUM AND ASSESSMENT POLICY STATEMENT

MC Maphalala
University of Zululand, Faculty of Education: Department of Curriculum & Instructional Studies, 3886, KwaDlangezwa, South Africa
E-mail: MaphalalaM@unizulu.ac.za

N Mpofu
Sol Plaatje University: School of Education, Unit for English Education, Central Campus, Kimberley, South Africa
E-mail: nhlanhla.mpofu@spu.ac.za

ABSTRACT
The purpose of this study is to explore possible assessment opportunities in the South African Curriculum and Assessment Policy Statement (CAPS) through Gardner's theory of Multiple Intelligences (MI). Although the CAPS document does not explicitly align itself to Gardner's theory, this paper attempts to explore the possibilities of using the eight MI in assessment at Senior Phase[1] a schooling grade in the South African secondary school. A burgeoning research output has focused on Gardner's theory of MI as a framework for designing a curriculum that meets different learning and teaching styles. In contrast, few studies have attempted to understand MI as an assessment framework. MI provides useful framework for teachers to consider eight intelligences in their assessment in order to cater for the diverse ways in which learners come to know in the classroom. This paper is written to argue that the traditional ways of assessing through tests and exams do not allow learners to demonstrate multiple intelligences they possessed. The paper followed a literature study approach where existing literature on MI was described and analysed in the light of assessment opportunities offered at Senior Phase curriculum in South Africa. From an analysis of literature and the Senior Phase curriculum, the paper does show a positive opinion of integrating Gardener's eight MI for holistic learner assessment. Furthermore, the paper also considers the implications of MI theory on teaching and proposes ways in which MI could be assessed within the curriculum.
Keywords: Assessment; Curriculum and Assessment Policy Statement (CAPS); Gardner's Multiple Intelligences; National Protocol for Assessment; Senior Phase

INTRODUCTION

Assessment is an integral part of teaching and learning process in any curriculum. As the ultimate goal of assessment is to improve learner learning, schools need to set up their own internal assessment policies to be in line with the curriculum offered and to provide a rich source of assessment information that will provide feedback to improve learner learning. A commonly held belief in teaching is that every learner is unique and possesses the ability to learn, and that we should develop their multiple intelligences (MI) and potentials, for them to succeed. Teachers therefore have a responsibility to implement assessment practices which are accommodative of learners multiple intelligences and ensure that assessment as an integral part of the learning, teaching and assessment cycle. Smith (2008) observes that the multiple intelligences theories has had a profound impact on thinking and practice in education, especially in the United States. It is necessary to apply the theory in other countries where the contexts are different from those of the United States.

The multiple intelligences (MI) theory recognises the fact that learners in the same class possess different abilities. According to Gardner (1995) all of us possess each of the intelligences, but no two individuals exhibit exactly the same profile of intellectual strengths and weaknesses. Each intelligence exhibits its own developmental trajectory. If assessed intelligences need to be approached in their own terms (an "intelligence-fair" way) rather than through the language-logic lens of a traditional test. Adopting different assessment modes and strategies could help to address different levels of performance and learner diversity as well as to provide equal opportunities for learners to demonstrate their achievements. Hence we understood that by embracing MI worldview in assessment we better equip the classroom practitioner with multiple ways of assessing, a strategy that enhances learners' intellectual strengths.

[1] [1] Senior Phase refers to the first three years of secondary education in South Africa and is aimed at learners of 13 to 15 years old.

Gardner's theory of MI has several implications for teachers in terms of assessment. Gardner's (1993) theory identifies eight intelligences that are needed to productively function in society. These intelligences are: linguistic intelligence, logical-mathematical intelligence, spatial intelligence, bodily-kinesthetic intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence and naturalist intelligence. Lane (2000) observes that this theory recognises that "we are all able to know the world through language, logical-mathematical analysis, spatial representation, musical thinking, and the use of the body to solve problems or to make things, an understanding of other individuals, and an understanding of ourselves" (p. 1). Teachers are therefore challenged to think of all intelligences as equally important. This is in great contrast to traditional education systems which typically place a strong emphasis on the development and use of verbal and mathematical intelligences.

The theory of MI implies that teachers should recognize and teach to a broader range of talents and skills. According to Brualdi (1996) the implication is that teachers should structure the presentation of material and assessment in a style which engages most or all of the intelligences. According to Hattangadi (2014) the idea of multiple intelligences is important because it allows for teachers to identify differing strengths and weaknesses in learners and also contradicts the idea that intelligence can be measured through IQ. He argues that Howard Gardner's theory of Multiple Intelligences provides a great alternative to the popular measurable IQ method. Mensch (1991) confirms that intelligence and IQ tests have always been used to classify people as intelligent or unintelligent or specifically to pass value judgments about their social status. From this background, the researchers argue that multiple intelligences should be an integral part of any school assessment because of its benefits to the learners, these benefits are discussed later in this paper.

In South Africa the National Curriculum Statement (NCS) implementation had some shortcomings which necessitated its refinement. In 2009 the Ministerial Committee was tasked with the review of the implementation of the National Curriculum Statement resulting in a Curriculum and Assessment Policy Statement (CAPS). CAPS was introduced to strengthen the National Curriculum Statement in order to improve the quality of teaching, learning and assessment in schools. With the introduction of CAPS, every subject in each grade has a *single, comprehensive and concise policy document* that provides details on what teachers need to teach and assess on a grade-by-grade and subject-by-subject basis. The aim of the NCS review was to lessen the administrative load on teachers and ensure that there is clear guidance and consistency for teachers when teaching and assessing. Most of the changes subsequent to the implementation of a post-apartheid curriculum in South Africa have been directly or indirectly driven by the teachers through their unions or through research that has been conducted on their experiences in implementing the curriculum. The implementation of CAPS also came along with National Protocol for Assessment Grades R – 12 which consists of guidelines on how to conduct assessment within the curriculum. Assessment in the National Protocol for Assessment Grades R – 12, is framed in terms of the following insights: Assessment is a process of collecting, analysing and interpreting information to assist teachers, parents and other stakeholders in making decisions about the progress of learners. The National Curriculum Statement Grades R – 12 is the formal curriculum in South African schools. Classroom assessment should provide an indication of learner achievement in the most effective and efficient manner by ensuring that adequate evidence of achievement is collected using various forms of assessment. The intention of this document is to regulate how evidence of learner performance is recorded and reported (DBE, 2011).

The South African Government Gazette 20844 of 4 February 2000 spells out the role of the educator as assessor in the following way:

> The teacher will understand that assessment is an essential feature of the teaching and learning process and know how to integrate it into this process. The educator will have an understanding of the purposes, methods and effects of assessment and be able to provide helpful feedback to learners. The educator will design and manage both formative and summative assessment in ways that are appropriate to the level and purpose of the learning and meet the requirements of accrediting bodies. The educator will keep detailed and diagnostic records of assessment. The teacher will understand how to interpret and use assessment results to feed into processes for the improvement of learning programmes.

As stated above, the role of teachers as assessors is to continuously gather valid and reliable information about the performance of the learner against clearly defined criteria, and using a variety of assessment and taking into consideration the contexts of learners and their developmental level. Assessment in the National Protocol for Assessment caters for both formative and summative assessments. In formative assessment learners are provided with ample opportunities to receive timely feedback to motivate them and guide their future learning. Formative assessment is necessary to track learners' progress over time, build up learners' confidence in themselves and help learners to take responsibility for their own learning. Summative assessment needs to be planned carefully

from the beginning of the year to include a variety of assessment strategies to provide learners with a range of opportunities to show what they have learned.

Children do not learn in the same way, as a result they cannot be assessed in a uniform fashion. Brualdi (1996) argues that, it is therefore important that teachers create an "intelligence profiles" for each learner. Knowing how each learner learns allows the teacher to properly assess the child's progress. The traditional ways of assessing through tests and exams did not allow learners to demonstrate multiple intelligences they possessed. This paper examined the assessment practices within the CAPS and how they reflect various MI. The paper also considers the implications of MI theory on teaching and proposes ways in which could be incorporated into the assessment at Senior Phase.

GARDNER'S THEORY OF MULTIPLE INTELLIGENCES

Gardner's Theory of Multiple Intelligences postulates that that there are at least eight different human intelligences. This theory was first proposed by Howard Gardner in his book titled: *The Frames of Mind* in 1983. The theory is based on two central propositions. The first proposition is that all human beings possess all the intelligences identified in the foregoing discussion. The proposition is that, because of our genetics and our environment, individuals possess unique profile of intelligences, because their experiences are different. These eight intelligences proposed by Gardner (1993) are:

- Visual/Spatial Intelligence which enables individuals to perceive their environment visually and manipulate visual images from the memory.
- Verbal/Linguistic intelligence: which enables individuals to effectively read, write and speak to relay a message.
- Logical/Mathematical intelligence: which enables individuals to solve mathematical operations, think logically and execute computing skills.
- Musical intelligence: which enables individuals to express themselves musically and through rhythm?
- Bodily/Kinesthetic intelligence: this enables individuals to use gross motor skills to perform physical activities.
- Interpersonal intelligence: which enables individuals to get along with others and be able to communicate with them. It allows people to work effectively with others
- Intrapersonal intelligence which enables individuals to understand themselves and be able to exercise self-control.
- Naturalist intelligence which enables individuals to understand their surrounding or the natural environment.

Gardner objected to the use of IQ as the only way of determining human intelligence hence he came up with various intelligences that define a human being. Gardner (1993) redefined intelligence as the ability to solve problems and fashion products that are valued in a particular cultural setting or community. This definition is in contrast with the traditional definitions which viewed intelligence as a unitary capacity which can be measured in terms of Intelligent Quotient (IQ) tests. Stanford (2003) observes that Gardner's theory challenged the notion that intelligence is something that can be objectively measured and reduced to a single quotient or score. He maintains that this approach only defines intelligence too narrowly. Multiple Intelligences theory encourages teachers to view learners as equals regardless of IQ scores produced tests or psychological assessments. Armstrong (2000) argues that MI is also accommodative of learners with special needs at it incorporates a wide spectrum of abilities. Armstrong maintains that teachers who view special needs in the context of the eight intelligences view all those learners as unique possessing different abilities. He contends that "using MI as a backdrop, educators can begin to perceive children with special needs as whole persons possessing strengths in many areas (p.104)." This implies that as much as teachers tailor teaching methods to suit the learner's individual learning styles the same should be extended to assessment.

LITERATURE STUDY: GARDNER'S MULTIPLE INTELLIGENCES AND ASSESSMENT

Multiple Intelligences theory has several implications for teaching and learning process. Campbell (1997) contends that MI makes a significant contribution to the teaching and learning process by encouraging teachers to expand their repertoire of techniques, tools, and strategies beyond the typical linguistic and logical ones predominantly used in classrooms. Edward (2004) argues that with today's increasing diversity among learners in terms of language, culture, religions, ability, and experience, it has become even more important to find strategies that meet a wide range of needs. School curriculum therefore needs to be accommodative of this diversity through use a various teaching approaches, resources, activities and assessment methods. Edward (2004) believes that Multiple Intelligences (MI) theory and strategies provide a framework and tools that can help teachers in designing classrooms, instruction, and curricula that meets the individual needs of many kinds of learners. Multiple intelligence theory is central to the holistic development of learners.

Assessment is an integral part of the teaching and learning process. Assessment should be part of every lesson and teachers should plan assessment activities to complement classroom activities. According to the Department of Education (DBE) (2002) assessment involves four steps: generating and collecting evidence of achievement, evaluating this evidence against the outcomes, recording the findings of this evaluation and using this information to assist the learner's development and improve the process of learning and teaching. Assessment is used for a variety of reasons such as individual growth, development and promotion. Teachers in different grades can transform assessment practices through MI by providing teachers with a basis for making instructional decisions and modifying teaching methods, and helps in grading learners' work for progression purposes. Teachers in different grades can transform assessment practices into meaningful MI. experiences. The use of various assessment methods by the teachers will help encourage their learners to demonstrate understanding through MI. activities. Collins (1998) maintains that Gardner's theory has not provided a detailed plan on how schools can implement MI in the classroom situation. It is therefore upon administrators, schools and teachers to interpret the theory informed by their own contexts. The researchers are of the view that there various ways in which learners can be assessed in order demonstrate learning and understanding in different intelligences. All intelligences are accounted for in various subjects in the curriculum/CAPS. This section therefore considers how each form of intelligence is accommodated in various Senior Phase (Grades 7-9) subjects in the Curriculum and Assessment Policy Statement. The researcher also identifies a variety of assessment techniques which teachers could use in their classrooms to assess different intelligences within the Curriculum and Assessment Policy Statement in South Africa. The following eight intelligences have been identified in the curriculum:

THE EIGHT INTELLIGENCES AND APPLICABILITY TO THE SOUTH AFRICAN CAPS (SENIOR PHASE)

Visual/Spatial Intelligence

Visual/Spatial Intelligence which deals with visual perception of the environment, it involves the capacity to think in images and pictures abstractly (Gardner, 2005). Visual/Spatial Intelligence is predominantly addressed under the Visual Arts section of the Creative Arts subject in the Senior Phase curriculum. According to DBE (2011) Visual Arts exposes learners to the content, concepts and skills of visual arts, through a range of different activities to develop a rich visual language and related skills. In Visual Arts learners are taught to express themselves in symbolic, visual ways. Opportunities are provided for social, emotional and intellectual development, and through non-verbal expression and the process of creating art, the learners come to understand symbolic language. The development of Visual/Spatial Intelligence is spread across other subjects such as Mathematics, Geography and Natural Sciences where symbols are used as well. Visual/Spatial Intelligence can be developed and assessed through drawings, illustrations, paintings, photographs, sculptures or sketches, power point, scrapbooks, videos, charts, graphs, map work, video tapes, laser disks, CD's, DVD's and posters. Learners with developed visual-spatial intelligences can express themselves well in symbolic and visual ways through paintings or drawings. Their assessment should therefore accommodate their unique abilities of expressing themselves.

Verbal/Linguistic Intelligence

Verbal/Linguistic intelligence involves reading, writing, speaking, to express oneself and relay the information. In Caps, Verbal/Linguistic intelligence is largely catered for in 11 official languages offered in the curriculum. Learning to use language effectively enables learners to acquire knowledge, to express their identity, feelings and ideas, to interact with others, and to manage their world. According to the DBE(2011) language learning requires learners to engage in prepared speech, unprepared speech, prepared reading (reading aloud), unprepared reading (reading aloud), debate, dialogue, interview, report (formal and informal), oral presentation/report, role plays, introducing a speaker, poetry, drama, novel, short stories, and folklore. All these learning activities are meant to develop Verbal-Linguistic Intelligence of the learners and time is allocated for each activity in the time table/curriculum to be addressed. Different learning activities help learners to develop language skills. These include: use of tone, voice projection and gestures; correct pronunciation of words without distorting meaning and to argue different viewpoints on a chosen topic.

According to DBE (2011) the language is a tool for thought and communication. It is also a cultural and aesthetic means commonly shared among a people to make better sense of the world they live in. It also provides learners with a rich, powerful and deeply rooted set of images and ideas that can be used to make their world other than it is; better and clearer than it is. It is through language that cultural diversity and social relations are expressed and constructed, and it is through language that such constructions can be altered, broadened and refined. Verbal/Linguistic intelligence is also developed in various subjects of the curriculum as the language serves as a medium of curriculum delivery.

Assessment activities such as presentations, storytelling, poetry, prepared and unprepared speeches and debates would be able to assist the teacher to determine and enhance this type of intelligence. Powers (2010) identifies reading, listening, writing, and speaking as four inextricably intertwined aspects of any language development. All these aspects are equally important in the mastery of language. This means that teaching and assessment of learners should appeal to all the four aspects of language learning. In assessment learners must be able to demonstrate that they are able to communicate effective. Powers (2010) argues that for effective communication to occur, people must not only speak or write; they also must understand how others have perceived their messages if they are to respond in ways that address their audience's concerns and questions. Effective communication is required to enable learners to engage in social interactions, within which they enhance their verbal skills and learn turn-taking, contingent responding and conflict resolution (Stock & Fisher, 2006).

Logical/Mathematical intelligence

Logical/Mathematical intelligence enables individuals to solve mathematical operations, think logically and execute computing skills (Armstrong, 2009). In CAPS the Logical/Mathematical Intelligence mainly features in Mathematics, Natural Sciences and Technology subjects in the Senior Phase curriculum. In Mathematics learners makes use of symbols and notations to describe numerical, geometric and graphical relationships. They are expected to observe, represent and investigate patterns and quantitative relationships in physical and social phenomena and between mathematical objects themselves. Mathematics helps to develop processes that enhance logical and critical thinking, accuracy and problem-solving that contributes in decision-making (DBE, 2011). Natural Science engages learners in a systematic way of looking for explanations and connecting the ideas they have. In Natural Science learners are engaged in observing, comparing, measuring, sorting, classifying living and non-living things as well as identifying problems and issues (DBE, 2011). All this contribute in developing learners' Logical-Mathematical Intelligence. In Technology learners are stimulated to be innovative and develop their creative and critical thinking skills. It teaches them to manage time and material resources effectively, provides opportunities for collaborative learning and nurtures teamwork. It enables them to develop and apply specific design skills to solve technological problems.

Learners with a developed Logical-mathematical intelligence have an ability manipulate numbers; and use logic, numbers and reasoning to understand the world around them. Assessment of Mathematical-Logical Intelligence could be conducted through activities that involve solving of mathematical problems, drawing graphs to explain information and experiments. Other learning materials that could be used to assess Mathematical-Logical Intelligence include calculators, puzzles, rulers and other measurement instruments. According to Hirsh (2004) mathematical intelligence involves a process, whereby a problem must be identified, recognized as something worth solving, an algorithm is then identified and/or created, and a solution is attempted. He contends that intelligence in this area requires a true understanding of how mathematics and logic work in the real world, in everyday life. Understanding the why in mathematics truly indicates an understanding of mathematic processes.

Musical Intelligence

Musical intelligence enables individuals to express themselves musically and through rhythm (Gardner 2005). Learners with Musical intelligence have can perform, compose and appreciate music. The Creative Arts subject in the Senior Phase curriculum provides exposure to and study of a range of art forms including dance, drama, music and visual arts (including design and crafts) Creative Arts helps to develop learners as creative, imaginative individuals who appreciate the arts and who have the basic knowledge and skills to participate in arts activities (DBE,2011). Creative Arts also provides learners with opportunities to experience dancing, to use their bodies safely, to develop fitness required for a particular dance, they learn movement sequences and begin to appreciate dance as a creative art. Learners play musical instruments, sing songs/melodies that match a particular mood and perform rhyming poems. Assessment of Musical Intelligence could be conducted through singing, playing musical tapes and videos, playing CD's, recording, composing of music by learners and performance.

Bodily/Kinesthetic intelligence

Bodily/Kinesthetic intelligence involves learning through physical movements and coordination using fine and gross motor skills (Armstrong, 2009; Gardner, 2005). In the senior phase a section on Physical Education encouraging learners to participate in fitness programme and teaching them about safety issues. Learners are encouraged to participate in physical activities such as sport and dance to improve their own fitness and physical wellness. Creative Arts subject also provides learners with opportunities of developing Bodily/Kinesthetic intelligence through dance, where they learn movement sequences and dramatize. Teachers can assess bodily-kinesthetic intelligences through dance, sports, simulations, exercises, physical movement, typing and dramatization.

Interpersonal intelligence

Interpersonal intelligence enables individuals to get along with others and be able to communicate with them. It allows people to work effectively with others (Gardner, 2005). Teachers, preachers, political leaders and sales people, all require a well-developed interpersonal intelligence. There are traces of Interpersonal intelligence in all the subjects offered in the senior phase curriculum, but Life orientation is the subject in which this intelligence finds much expression and attention. In the Life Orientation subject learners are encouraged to develop beneficial social interactions, such as respecting others' rights and values. It also promotes lifelong participation in recreation and physical activity. Through the use of various teaching methods such as role plays, group discussion, pair work, debates, case studies interpersonal Intelligence is developed. These teaching methods encourage learners to participate actively and reinforce learning through interaction and sharing of ideas. Conversations amongst the learners create an opportunity for them to practice various skills such as communication, ability to articulate one's ideas and defend them, interpersonal skills and the ability to respect a different point of view. Interpersonal Intelligence can be assessed engaging learners in debates, group discussions, pair work, group projects, role plays, panels and group work. Learners who possess strong interpersonal intelligence relate and get along well with other people. Their assessment may involve activities that require them to interact and work with other people.

Intrapersonal intelligence

Intrapersonal intelligence enables individuals to understand themselves and be able to exercise self-control (Armstrong, 2009). A person with a highly develop intrapersonal intelligence has an ability to do self-reflection to identify their strengths and weaknesses for self-improvement. In Life Orientation a section on the development of the self in society addresses the concept of self-image in which learners are supposed to identify and reflect on positive personal qualities and relationship with self, family, and friends. Teachers use various learning activities (such as role play, drama, journal) to enhance self-image through instilling positive attitudes. In this section on the development of the self, learners are taught about self-image; peer pressure; personal diet and nutrition; self-formation and self-motivation; sexuality; relationships and friendships; goal-setting skills: personal lifestyle choices; sexual behaviour and sexual health and dealing with challenging situations such as depression, grief, loss, trauma and crisis (DBE, 2011). People with Intrapersonal intelligence understand themselves very well, they are aware of their strengths, weaknesses, emotions and moods as well as how to appropriately act on them. This intelligence can be assessed through self-reflection activities, diary entries, meditation exercises, journals, personal stories, self-assessment, memoirs, role play, drama and case studies. Smith (2008) observes that people with intrapersonal intelligence will demonstrate understanding of oneself, appreciate one's feelings, fears and motivations.

Naturalist intelligence

Naturalist intelligence enables individuals to understanding the natural environment (Moran, Kornhaber & Gardner, 2006). People with the Naturalist intelligence have a relationship with the natural environment; they appreciate plants, animals and nature resources. In the Senior phase the Social Science subject is made up of History and Geography sections. Naturalist intelligence finds it expression and prominence in the Geography section of Social Science. Geography helps learners to understand their environment. It alerts learners about human activities that affect the environment and how to interact with the natural environment. Natural Science is another subject in the curriculum that develops Naturalist intelligence in learners as it teaches them about natural resources, such as plants, and animals. Individuals with the Naturalist intelligence relate well with their natural environment, they understand and care about it. Naturalist Intelligence can be assessed by engaging learners in field trips, outdoor activities, solving environmental problems, planting trees, their interaction with animals, draw or photograph natural objects, describe geographical sites and features, identify and classify birds/trees/insects and write about caring for plants and animals.

This section has demonstrated MI Intelligences are integrated into the Curriculum and Assessment Policy Statement, however there were no indications of how each intelligence is assessed in the curriculum. The researchers put forth various ways in which these intelligences could be assessed by the teachers. Brualdi (1996) advise that teachers must seek to assess their learners' learning in ways which will give an accurate overview of their strengths and weaknesses. As learners do not learn in the same way, they cannot be assessed in a uniform fashion. Therefore, it is important that a teacher creates "intelligence profiles" for each learner. Knowing how each learner learns will allow the teacher to properly assess the child's progress (Lazear, 1992). This individualized evaluation practice will allow a teacher to make more informed decisions on what to teach and how to present information. Traditional tests (e.g., multiple choice, short answer, and essay) require learners to show their knowledge in a predetermined manner.

IMPLICATIONS FOR THE GARDNER'S THEORY OF MULTIPLE INTELLIGENCES ON ASSESSMENT

The theory proposes that human beings possess a unique blend of intelligences. MI provides eight different potential pathways in which learning can take place in the classroom. Teachers have an opportunity to switch between the eight different intelligences to ensure effective learning. Multiple intelligences caters for learner diversity, irrespective of their developmental level, it could be used right from early childhood to higher education, applying the same basic guidelines. Brualdi (1996) observes that MI has several implications for teachers in terms of classroom instruction as all eight intelligences are needed to productively function in society. He argues that teachers should think of all intelligences as equally important. A classroom is a heterogeneous environment with learners from diverse backgrounds possessing different abilities. Teachers have a huge responsibility of embracing diversity into their classrooms by using various teaching strategies, resources and learning activities that develop most if not all intelligences.

Learners come into the classroom with different sets of developed intelligences, which means that each child will have his own unique set of intellectual strengths and weaknesses (Brualdi (1996). This will be mainly due to the experiences that learners have been exposed to prior to coming to the classrooms. The prior experiences will therefore determine how determine how easy (or difficult) it is for a learner to learn information when it is presented in a particular manner. It is very important for the teachers to baseline assessment at the beginning of the year to establish what learners already know so as to planning of learning programmes and learning activities that would deal with any identified weakness. Formative assessment can then be continuously conducted to monitor and support the teaching and learning process. According to Lazear (1992) the teachers can show learners how to use their more developed intelligences to assist in the understanding of a subject which normally employs their weaker intelligences. For example, a learner with a highly developed musical intelligence in an early childhood classroom can be taught counting by compiling a song for him or her that would include singing numbers chronologically. Theory of Multiple Intelligences implies that teachers should recognize and teach to a broader range of talents and skills. By appealing to a wide range of intelligences, teaching in this manner can facilitate a deeper understanding of the subject material. (Lazear, 1992).

MI makes a valuable contribution to education as it helps teachers improve their classroom practices and encourage them to look beyond traditional ways of teaching and assessment, which did not consider learners' diverse abilities and intelligences. An understanding of MI theory broadens teachers' awareness of their learners' knowledge and skills and enables them to look at each learner from the perspective of strengths and potential. Teachers also become aware of the different ways in which learners may demonstrate their understanding of material. MI theory provides a structured way of understanding and addressing the diversity that ESL instructors often encounter in the classroom (Christison, 1996).

CONCLUSION

This paper argues for the use of Gardener's MI as an assessment framework in addition to its use as a curricula perspective. The South African Senior Phase curriculum was used as an example to explore the possibilities of underpinning assessment in teaching using MI. Although the South African school system was used as a research site, the insights from the paper can improve practice in the different locales in the world. The review of existing literature and curriculum documents reveal a lot of possibilities in assessing all the learners' intelligences. Fostering these intelligences in assessment should not be an add-on but an integral part of everyday planning, teaching and assessment. Learning activities in the classroom should focus on developing one or more of these intelligences. The use of various assessment methods by the teachers will help encourage their learners to demonstrate their learning through MI activities.

REFERENCES

Armstrong, T. (2000). *Multiple intelligences in the classroom*. Alexandria, VA: Association for Supervision and Curriculum Development.

Armstrong, T. (2009). *Multiple Intelligences in the Classroom* 3rd Ed. Alexandria, VA: Association for Supervision and Curriculum Development.

Brualdi, A.C. (1996) *Multiple Intelligences: Gardner's Theory*. Washington DC: Eric Digests. Retrieved from: http://files.eric.ed.gov/fulltext/ED410226.pdf

Campbell, L. (1997) 'Variations on a theme—How teachers interpret MI theory' *Educational Leadership,* 55(1), 14–19.

Christison, M.A. (1996) 'Teaching and learning languages through multiple intelligences' *TESOL Journal,* 6 (1), 10–14.

Collins, J. (1998) How to make a better learner: Seven kinds of smart. *Time Magazine Online*. Retrieved from: http://www.time.com/time/magazine/article/0,9171,989359,00.html

Department of Basic Education (2011) *Curriculum and Assessment Policy Statement: Grades 7– 9: Mathematics*. Pretoria: Government Printing Works.

Department of Education. (2002). *Curriculum 2005 Assessment Guidelines for Inclusion*. Pretoria: Government printers.

Edward, G.F. (2004). How Multiple Intelligences Theory Can Guide Teachers' Practices: Ensuring Success for Learners with Disabilities. Retrieved from: http://www.urbanschools.org/pdf/onPOINTS.multiple.intelligences.DOCUMENT.style.LETTERSIZE.pdf

Gardner, H. (1993). *Frames of Mind: The Theory of Multiple Intelligences*. New York: Basic Books.

Gardner, H. (1993). *Multiple Intelligences: The Theory in Practice*. New York: Basic Books.

Gardner, H. (2000). *Intelligence Reframed: Multiple Intelligences for the 21st Century*. New York: Basic Books.

Gardner, H. (2005). *Multiple lenses on the mind.* Paper presented at the ExpoGestion Conference, Bogota Colombia, and May 25, 2005.

Hattangadi, V. (2014). *Multiple Intelligences of Howard Gardener: Intelligence in the Making*. Retrieved from: http://drvidyahattangadi.com/multiple-intelligences-of-howard-gardener/

Hirsh, R.A. (2004). Excerpt from *Early Childhood Curriculum: Incorporating Multiple Intelligences, Developmentally Appropriate Practice, and Play.* Upper Saddle River, NJ: Pearson Education, Inc. Retrieved from: http://www.education.com/reference/article/logical- mathematical-intelligence/

Lane, C. (2000). *Implementing Multiple Intelligences and Learning Styles in Distributed Learning/IMS Projects*. San Clemente: The Education Coalition (TEC). Retrieved from: http://www.tecweb.org/styles/imslsindl.pdf.

Lazear, D. (1992). *Teaching for multiple intelligences.* ERIC Document Reproduction Service No. ED 356 227.

Mensch, J. R. (1991). Phenomenology and Artificial Intelligence: Husserl Learns Chinese *Husserl Studies,* 8, 107–127.

Moran, S., Kornhaber, M. & Gardner, H. (2006). Orchestrating multiple intelligences *Educational Leadership,* 64(1), 22–27.

Powers, D.E. (2010). The Case for a Comprehensive, Four-Skill Assessment of English-Language Proficiency. Retrieved from: *https://www.ets.org/Media/Research/pdf/RD_Connections14.pdf*

Smith, M.K. (2008) Howard Gardner and multiple intelligences. *The Encyclopedia of Informal Education.* Retrieved from: http://www.infed.org/thinkers/gardner.html

Stock, C.D. & Fisher, P.A. (2006). 'Language delays among foster children: implications for policy and practice. *Child Welfare*, *85*(3), 445–461.

"BUILDING ON THE IDEAS AS OPPOSED TO TEARING DOWN IDEAS": IMPROVISER FACILITATORS' CONTRIBUTIONS TO WORKPLACE LEARNING

Nicole A. Buras
Department of Counseling, Adult and Higher Education, Northern Illinois University
nicoleburas@gmail.com

Author's Note
This research was part of a doctoral dissertation. A presentation of this paper was presented as a referred-full manuscript for the 2016 AHRD conference in Jacksonville, Florida. This paper was substantially revised and extended.
Correspondence concerning this article should be addressed to Nicole Buras, 4827 N. Kimball Ave. #3 Chicago, Illinois. Phone: 773-757-4574 Email: nicoleburas@gmail.com

ABSTRACT
When people think of improvisation, typically, performance arts come to mind. However, improv has offstage uses in adult learning—and more narrowly in workplace learning. The purpose of this study was to examine trained improviser facilitators' uses of improvisational strategies in workplace learning. The conceptual framework drew from literature on improvisation and applications of improv in workplace learning. This study employed a basic interpretive qualitative approach. Sixteen participants participated in this study, and data collection included interviews, participant responses to a reflective writing prompt, and artifacts. Results from this study highlighted the benefits an improviser facilitator provided in workplace learning. Improvisation motivated embodied awareness of oneself and others and exemplified experiential learning in workplace learning. Additionally, improvising the improv training allowed facilitators to meet the needs of the employees in workplace learning. This study demonstrated how improv in workplace learning aligned with an understanding around organizational learning and learning organizations. This study included a discussion of future research on the integration of improv in workplace learning.
Keywords: improvisation, workplace learning, experiential learning

"Building on the Ideas as Opposed to Tearing Down Ideas": Improviser Facilitators' Contributions to Workplace Learning

Improv and improvisation refer to a spontaneous theatrical art (Halpern, Close, & Johnson, 1994; Napier, 2004; Spolin, 1999; Zaunbrecher, 2011). For example, readers associated with American television comedy may be familiar with a modern representation featured on The CW network called *Whose Line is it Anyway?* (IMDb, 2015). *Whose Line is it Anyway?* shows performers developing scenes or skits without advance planning, based on a prompt given from outside of the ensemble (IMDb, 2015). So how did this performance art often associated with comedy (Halpern et al, 1994) make its way into the business world?

A growing body of practitioner literature (Bernard & Short, 2012; Koppett, 2001; Salinsky & Frances-White, 2008) and studies (FitzPatrick, 2002; Miner, Bassoff, & Moorman, 2001; Vera & Crossan, 2005) have addressed the incorporation of improvisation in business. Business curricula in higher education have also integrated improv tenets and exercises (Aylesworth, 2008; Huffaker & West, 2005). Some organizations have employed improv performers turned facilitators to design and implement training workshops (Quintanilla, 1999; Salinsky & Frances-White, 2008); in fact, a substantial income source for some improv organizations comes from corporate entertainment and trainings (Quintanilla, 1999). As time progresses, this spontaneous art form has continued to establish a place offstage in workplace learning.

The majority of literature incorporating improv offstage in business has been practitioner based. Limited research exists on the role and value of the improviser in workplace learning and more largely adult learning. The objective of this study is to examine trained improviser facilitators' uses of improvisational strategies in workplace learning.

This study is significant in developing an understanding of improviser facilitators' experiences in workplace learning and the functions, improvisational tenets, and strategies served in organizational learning. The knowledge gained in this study may prove valuable to companies' training and development departments, improvisational organizations offering training to businesses, and educators in adult education. Companies and improv facilitators may draw from this study's discussion of techniques used to cultivate receptive learners, experiential learning environments, and flexible, learner-centered trainers. This study also adds to the understanding of cultivating organizational learning and learning organizations, as improvisation in workplace learning personifies both. Through a basic interpretive qualitative approach, this study sought to answer the following research questions: 1.) What are the experiences of improvisational professionals using improv in

workplace learning?, and 2.) According to participants, what function does improvisation serve in the context of workplace learning?

Important Components of Improvisation On- and Offstage

To begin to understand the functions of improv facilitators in workplace learning, it is first important to understand the components of improvisation. The most critical element of improvisation is the participants who engage in improv. The literature refers to these participants as performers, improvisers, improvisors, or learners (Spolin, 1999; Zaunbrecher, 2011). Additional important components to consider include the rules of improv and the setting.

Spolin (1999) explained that anyone can improvise; in fact, individuals engage in improv early in life because everyone constantly reacts spontaneously to circumstances. When someone actively seeks to focus on honing improv as a craft (Zaunbrecher, 2011) he or she becomes an improviser. Then these improvisers come together, create improvised theater, and hone their skills (Napier, 2004). An improviser's learning does not cease once he or she begins to perform and apply improv in other settings (Salinsky & Frances-White, 2010; Spolin, 1999).

Improvisational rules and the underlying tenets serve as overarching guidelines for improvisers. The improvisers consider conditions and rules set prior to an improv activity or performance. Conditions include the group of improvisers, the venue, relationships between improvisers and viewers, and organizational decisions of the performance (Zaunbrecher, 2011). Specific games contain rules that can override the guiding rules of improv. For example, one improv rule is "don't ask questions" because it forces the other person to contribute when you could have contributed instead (Halpern et al., 1994). On the other hand, the improv game "questions" consists of one rule: all dialogue must be in the form of a question. In the context of the game, asking questions supersedes the guiding rules of improvisation (Halpern et al., 1994).

Improvisers should consider the improvisational setting, whether it is a stage, meeting room, or class. Improvisation differs from other performing arts because improv uses less equipment and technical systems. Improv may take place almost anywhere (Spolin, 1999). A safe environment is a requirement for encouraging participation; as a result, improv hinges on a supportive setting (Crossan, 1998; Ronen, 2005; Salinsky & Frances-White, 2010). In sum, the key elements of performance improv include the improviser, rules, and environment (Spolin, 1999). The next section builds on the discussion by addressing these and other elements involved in integrating improv into business.

Improvisation in Corporate Organizations

A review of literature revealed that companies found value in incorporating improv tenets and techniques into workplace learning and other business processes (Crossan, 1998; FitzPatrick, 2002; Miner et al., 2001). Crossan and Sorrenti (1997) outlined the connection between performance arts, corporations, and the role improv may play in business. The authors painted a picture of a company operating in a similar fashion to a theatrical performance. Plays and companies alike, they argued, functioned with a goal in mind in a set context. A company's leadership shaped the direction of the production; as a result, the CEO served as the director, the vice president's role was assistant director, and an employee's supervising manager represented the stage manager for actors. Improv performances paralleled the day-to-day business operations of a company, with actors, much like employees, playing critical roles in the process.

According to Crossan and Sorrenti (1997), the actors represented the employees. All individuals, actors or employees, performed within the context of the play or business. The production's plot and the theater's environmental factors, such as its location, serving community, and talent pool, drove the theatrical performance. Similarly, the business's objective, consumer demographics, ranking with respect to other companies, policies and systems, and other variables drove the business (Crossan & Sorrenti, 1997). Workplace learning fits into this context because a primary goal of training and development is to effectively harness employees' potential to meet a company's objectives (Johnson, 1976). Organizational learning takes place in a company when employees learn, develop, and share knowledge in service of the company with the common goal to advance the organization (Senge, 1990).

With this analogy in mind, if a business functions like a play, the company has the option of constraining itself to its traditional strategic systems and concrete roles and responsibilities (Crossan, 1997; Crossan & Sorrenti, 1997). This approach, however, can inhibit innovation, flexibility, and change (Crossan, 1997). What happens to the play when the show closes? The theater company breaks down the set, and members go on to other projects. Similarly, what happens to a company when it becomes stagnant and faces challenges? Companies typically follow the same planning processes used for years, which arguably stifles creativity and does not allow businesses to keep up with an ever-changing economy (Crossan, 1997). To combat this stagnation, Crossan and Sorrenti (1997) suggested the inclusion of improvisation.

Rules and setting factors influence improvisers and improv onstage (Spolin, 1999; Zaunbrecher, 201). Improv philosophies included recognition of one's foundation (Salinsky & Frances-White, 2008) but also

embraced flexibility, creativity, analytical decision making, and new possibilities (Aylesworth, 2008; Crossan, 1997). Improv is spontaneous, so it can be unpredictable; however, considering supporting factors can influence the process and quality of outcomes (Vera & Crossan, 2004). Chelariu, Johnston, and Young (2002) created a typology linking improv and learning theory in the field of marketing as a means of dealing with the ever-changing world of business. The authors found that to incorporate improv successfully, members needed a level of improv proficiency and strategically set parameters (Chelariu et al., 2002). Improvised jazz provided an appropriate analogy because one must have a certain level of musical proficiency to improvise jazz, and for businesses, one must have a level of knowledge and proficiency in that business (Crossan & Sorrenti, 1997). With this being said, one engages in reflection-in-action by responding effectively in time to new situations by drawing on his or her existing foundation (Ahmed & Al-Khalil, n.d.; Schon, 1987).

Crossan and Sorrenti (1997) identified in detail four areas where proficiency was critical in determining the level of quality (pp. 167–174). First, "intuitive insight" involved one's historical knowledge and abilities in an area that could facilitate innovation. Second, "technical ability" involved obtaining required skills in an area to increase potential solutions. Third, "group dynamics" in business involved constant social interaction; thus, producing quality results required a positive culture, trust, and open, supportive communication. Finally, the authors explained the need for "motivation, awareness, and understanding." Members would not use improv if individuals and the group were unaware, not interested, or lacked understanding of improv. In fact, if incorporated under these circumstances, improv would likely yield negative results. The authors stated that organizations should use improv with caution, as improv could lead to irresponsible behavior and unpredictable results. Successful improv required a focus on process, participants' full engagement, organizational memory, and a supportive and experiential organizational culture (Crossan & Sorrenti, 1997).

Members can develop improv proficiency, and it is the manager's responsibility to nurture the process (Vera & Crossan, 2004). Improvisation can occur at many levels of planning and implementation (Miner et al., 2001). Three situations in which organizational improvisation often occurs are as follows: when creating and revising strategy, when facing a crisis or disaster, and when providing metaphors for unconventional perspectives (Crossan & Sorrenti, 1997). Improv can play an important role in learning and skill development at individual, team, and organizational levels (Crossan & Sorrenti, 1997; Miner et al., 2001). This study adds to the exploration of integrating improv in business by examining improviser facilitator uses of improv as a tool in workplace learning and the functions they perceive improv serves in the context of workplace learning.

METHODS

Guided by a review of literature and a pilot study, the researcher employed a basic interpretive qualitative approach. This approach draws from phenomenology (Husserl, 2012) and symbolic interaction (Mead, 1962). Phenomenology is the study of purposely developing understanding from interpreting experiences (Husserl, 2012). Symbolic interactionism deals with individual learning as a product of social engagement (Mead, 1962). Learning is active and, depending on context, both internal and social (Mead, 1962; Vygotsky, 1993). The constructivist frame denotes that an individual's understanding and knowledge come from one's process of development, meaning from experiences in engaging in the world (Vygotsky, 1993). This study investigates improvisational facilitators' experiences and the perceived functions improv serves in workplace learning. As a result, a basic interpretive qualitative approach is appropriate for this study because it centers on how individuals create and draw understanding from internal and social experiences (Husserl, 2012; Mead, 1962; Merriam, 2009; Vygotsky, 1993).

Embracing a basic interpretive qualitative method encourages various approaches to collecting data (Merriam, 2009). Past studies exploring improvisational philosophies and practices offstage informed this study. These studies examined experiences through interviews, observations, and reflective journaling (Elsey, 2007; Miner et al., 2001). A pilot study also served to further refine design decisions. For example, the pilot study included interviews and participant observations. Observations presented a challenge in obtaining consent and in scheduling; therefore, participant observations are purposefully absent from this study, which focused on conducting interviews.

The researcher interviewed fifteen improv facilitators and one nonimproviser from an improv organization's business side. Interviews ranged from 50 to 120 minutes, with the average interview lasting 70–75 minutes. The researcher also collected data via facilitators' short reflection papers on a typical training and artifacts, which included marketing materials, lesson information, and online résumés and bios.

To identify emerging themes, the researcher employed open, axial, and focused coding. Axial coding allowed for noting tentative categorical connections (Saldana, 2009), and the researcher used focused coding to get to the meaning behind the connections or disconnections (Saldana, 2009). The researcher employed three techniques to enhance trustworthiness: member checking, employing an outside auditor, and developing an audit trail. During interviews, the researcher checked with participants to confirm accurate understanding; furthermore, during my examination of initial descriptive findings, the researcher requested that some of the participants review the findings and make correction to provide clarity around his or her meaning. Both these

approaches were used to ensure authenticity of my interpretations. The researcher also kept an audit trail and employed an outside auditor to enhance trustworthiness (Lincoln & Guba, 1985).

FINDINGS

The functions an improviser facilitator provided in workplace learning included the following themes: 1) improv motivated embodied awareness of oneself and others in workplace learning, 2) improv exemplified experiential learning in workplace learning, and 3) improvising the improv training allowed for meeting the needs of the employees in workplace learning. Participants explained that improv provided employees with a heightened sense of awareness during trainings. Improv facilitators also discussed that their adaptability in delivery provided a service, as it involved accepting feedback and changing to meet the needs of the situation.

Improv Motivated Embodied Awareness of Oneself and Others in Workplace Learning

Improv facilitators discussed that employees experienced embodied awareness through the incorporation of improvisational tenets. One improv tenet that every participant discussed was a safe, judgment-free learning environment. The literature also echoed the importance of a supportive setting (Crossan, 1998; Ronen, 2005; Salinsky & Frances-White, 2010). Participants explained that within this environment, employees developed the skill of developing self-awareness and being others focused—another tenet of improvisation. With this embodied awareness, employees experienced the skills their employer wanted them to develop.

Cultivating a Safe, Supportive Setting. Participants explained that at the beginning of a workshop, they addressed the ground rule of suspending judgment, which fostered a safe learning environment. Improv facilitators worked with employees on developing internal awareness. The facilitator challenged employees to consider the state of mind in which they entered the training; such states could be excited, nervous, afraid, or suspicious of the workshop's relevance and application to their work. Participants noted that sometimes, individual employees' fear inhibited them from effectively participating in improv games and connecting improv tenets to the company's goals. Improv and adult learning writers both addressed fear in learning as a major challenge for learners (Halpern, et al, 1994; Salinsky & Frances-White, 2008; Smith, 1982; Spolin, 1999).

If a facilitator does not construct a safe environment, learners will self-negate and not grow (Ronen, 2005), which inhibits the objective. In building on one's self-awareness, employees are challenged to, as Eliza explained, "get out of their own way" and recognize that it is acceptable to be afraid and to fail. Participants explained that performance improv embraces failure as a gift, because failure provides the opportunity for creativity and innovation. Improv facilitators managed employees' fear and other negative emotions by constructing a safe learning environment through suspending judgment, providing a workshop overview, promoting the tenet that all choices are correct, and explaining that learning occurs through failure. In a judgment-free space in improv (Spolin, 1999) and business (Crossan, 1998), individuals will challenge themselves to progress beyond their comfort zones with their colleagues.

Self-Awareness and Becoming Others Focused. Once improv facilitators established a safe space and obtained agreement from employees, the participants worked on developing skills around becoming others focused. In improvisation, the contributing members are at the core of the work (Spolin, 1999; Zaunbrecher, 2011). Employees cannot be others focused if they are not aware of themselves or allowing themselves the freedom to experience and learn, because they may spend the entire training reflecting internally, unable to connect and build with peers. Gary emphasized, "improv is all about the group, improv is not about me." Philip also discussed during a follow-up conversation that being others focused was not solely an employee goal. Improv facilitators also must practice what they preach and be others focused during a training, which echoed Rogers and Freiberg's (1994) facilitator ideals. Educators should focus on the student and learning process and not on themselves and their instruction; an educator should be receptive and open to adapting to students' needs (Rogers & Freiberg, 1994). Improv facilitators must lead by example, embody the improv tenets and their foundation, and draw from employees' feedback. This further demonstrates drawing from components of improvisation onstage (Halpern et al., 1994; Zaunbrecher, 2011) and offstage in business (Crossan & Sorrenti, 1997).

All participants noted the others-focused tenets helped businesses in team building and interpersonal communication. Eliza discussed the service improv provides in business by noting, "[W]hat it gives is an understanding to the employee, the importance of valuing others." Writings addressing the employment of improv in multiple settings explained that improv motivates individuals to focus on others in the group and to work together toward a common goal (Echle, 1991; Halpern, et al, 1994). This promoted group development and further reinforced a safe learning space (Echle, 1991; Maples, 2007; Spolin, 1999). Eliza further elaborated on the meaning and actions required in truly "valuing others." She explained,

> [W]e talk in great depths about the idea of really listening to someone. Into what does that means, and how difficult that really is. And the idea of, how can we create a culture where we're building on the

> ideas as opposed to tearing down ideas, and that's not going to be a great fit for every single organization.

Eliza's discussion of "valuing others" in business provided a lens in understanding the alignment between organizational learning and a learning organization (Illeris, 2004). A company culture constructed to value group learning includes collectively recognizing and valuing each employee's ideas so the contributions play a role in group learning; as a result, this construction of knowledge represents a learning organization (Senge, 1990). When a company hired improv facilitators to hone team building and others-focused skills, employees engaged in meaning making within a company context and in service of the business, which denotes organizational learning (Senge, 1990). Eric echoed Eliza's rationale and richly described how improv assisted employees in embodying awareness of others to enhance business. Eric noted:

> So much of the business world now comes down to individual relationships. Whether that's internal or external, how well do I work with the people that I'm working with? And how well am I listening to serving my client? And how well am I understanding my place and other people's place in this endeavor, whatever this endeavor is? Those things are all served by improv, if I'm more aware of my skills, and more open to the possibility of growth. And I can constantly be in the space of improvement and adjustment. If I'm truly appreciative of what I bring to the table and what other people bring to the table, then I see everybody's participation in a slightly different way. And if I'm really engaged and listening and focused in that way, I am putting aside my own agenda to serve my client or my coworker or whatever, that other person. Those are all improv skills.

Eric's reflection on actively engaging and listening while striving to move beyond personal desires represents the improv tenet of others focused. Putting others first signifies a key component in building an improv ensemble for performance (Halpern et al, 1994), which translates to developing a learning organization in business (Senge, 1990).

With all this being said, participants also addressed a concern expressed by employees with regard to the tenet others focused. The improv facilitators explained an ideology of individualized success in business. Similar to Eliza's disclaimer, "that's not going to be a great fit for every single organization," they provided a disclaimer that the tenet others focused does not work in all company environments. Crossan (1998) explained that some may struggle to embrace the collaborative aspects involved in improvised learning because Americans promote individualism and competition.

Implementing improv challenges groups to develop trust in teams and work as a collective toward common goals (Crossan, 1998; Spolin, 1999). Tim spoke to this tension: "Usually, or at least the perception is, it's an either/or. That if I'm going to succeed, I have to put myself first, before the ensemble, before the rest of the team." As a response to this concern, improv facilitators addressed that a value in being others focused is that when a group is successful, so, too, are the individuals within that group. Tim explained that the improv organization he worked with provided examples of group and individual success:

> [W]hat we've shown is that you can have both. You can be really effective as an ensemble. That's why we are where we are. But you can also then take all you learned there and go on to greater things, onto individual success. So that's the paradox.

The rationale surrounding improv's focus on others suggests that if the ensemble or employee team thrives, then individuals succeed. With that being said, if each member of the group does well, so too does the larger organization.

Improv Exemplified Experiential Learning in Workplace Learning

Another component of embodied awareness is a side effect of improv's being different from traditional training, such as lectures, presentations, videos, and training manual delivery. Participants explained that all those approaches showed rather than allowed firsthand experience of the content for the employee, and that this was often the reason that businesses desired improv trainings. Jeremy explained the difference between the improv workshops and traditional training approaches by noting, "[I]mprov is a lot like learning how to swim. You can have a PowerPoint about all you want, but if [until] they get into the water you really won't understand." Participants discussed how improv provided experiential learning, which allowed employees to hone additional skills while also becoming others focused.

The hiring company determined the target skills. Participants noted that when employees engaged in skill-building experiences, such as improv games and role play, it increased the likelihood that they would retain the content. Philip explained, "The fact that improv workshops are experiential usually means that they resonate longer." Michael also supported the idea of improv's enhancing retention by highlighting, "they are actually absorbing content better than if they just sat in a room and just listen[ed] for five or eight hours." Improv provided employees with the opportunity to connect through social engagement in events (Kolb, 1984) and

encouraged employees to work together to construct knowledge (Smith, 1982; Vygotsky, 1993). Philip further discussed how improv assisted in intangible skill development, such as active listening; Philip explained:

> [T]o be engaged in exercise, which gives you the experience of active listening versus nonactive listening, gives the term active listening meaning that it wouldn't have if I simply stood at the front of the room and said it's important to actively listen. Then, when I say active listening, you have an experience that you can associate with that as opposed to just its being a buzzword.

In improv training workshops, employees experienced the company-determined skills of focus with other members. Improv facilitators also challenged employees to critically reflect on the improv experience, which, they argued, further enhanced understanding and retention for the experiential skill building. Reflective questions and discussions inspired employees to link improv tenets to work experiences and personal life. These reflective experiences referred to reflection-in-action (Schon, 1987) and drew on members' existing knowledge, skills, and interpersonal connections (Crossan & Sorrenti, 1997). Collaboration and reflective opportunities in the workplace allowed individuals to learn from others and make meaning for themselves (Sawyer, 2004).

Improvising the Improv Training Allowed for Meeting the Needs of the Employees in Workplace Learning

Improv facilitators richly discussed that improvising within workplace learning facilitated meeting the needs of the employees. Improv facilitators possessed honed improvisational skills of adaptability and flexibility, which they demonstrated on stage when developing spontaneous scenes (Salinsky & Frances-White, 2008; Napier, 2004; Spolin, 1999). They explained that, when assuming a facilitator role, they continued to develop these educator skills; as a result, they adjusted, dropped, or added in improv exercises and methods of debriefing as a response to information acquired from the employees while training—a process unavailable when trainers adhered to a strict plan. Kathy highlighted, "[I]mproviser trainers, as opposed to any other trainers, are deeply prepared to not only adapt in the moment" but also "adjust the training as needed for the room." Improvisational philosophies and approaches allowed the facilitators freedom to customize the exercises and discussions.

An improv facilitator's flexibility allowed for changes to a training plan to better serve the learning style of the group of employees. An improviser has a honed ability to reflect in time; they draw on existing knowledge, analyze a current situation, and respond as needed to the circumstances. Jeremy explained that the role of improv is to "allow the performers to tailor the training as they go." Similar to educator training, a predetermined lesson guides improv facilitators; however, Ahmed & Al-khalil (n.d.) found even in educator training reflective teaching practices were found to improve one's practice (Ahmed & Al-khalil, n.d.). Jeremy further distinguished between preplanned templates and an improviser's ability to adapt. He explained that a "typical training has a baked in [aspect]... like everything is prepared. ... if the conversation goes in different directions, it's difficult to then, for the subsequent activity, take that into account." Even though improv workshops drew from a lesson, the improv facilitators and improv tenets provided a component of adaptability for lessons. Jeremy illustrated this flexibility: "we're working with a group of pharmaceutical salespeople and in the first hour a specific challenge or issue comes out, because improvisation, the way that we work will naturally fold that in all of our conversations." According to participants, the improv facilitator built on the employees' feedback organically and adapted the path toward interest to reach the final destination, i.e., the company's desired area of focus. This incorporation of employees' foundations allowed them to draw on proficiency outlined by Crossan and Sorrenti (1997), which enhanced the quality of the experience. The participants recognized employees as active participants in the learning organization (Rogers & Freiberg, 1994; Senge, 1990).

These customizations came in the moment, as a reaction to how the employees responded to each step along the path to reach the goal. Participants noted that by allowing this, employee investment and engagement increased due to the creation of personal connections. It is important to note that, even though approaches shifted, areas of focus of the training did not change; rather, the path to reach the final destination changed.

DISCUSSION

This study examined the function the improvisational facilitator and improv served in workplace learning. Participants discussed creating a safe, judgment-free learning environment. In this atmosphere, employees experienced personal, embodied awareness. Employees also collaborated experientially while developing the skill of being others focused in addition to honing skills predetermined by company leadership. This study added to the dialogue around drawing on industry knowledge and skills (Crossan & Sorrenti, 1997) to integrate improv into workplace learning. Improv facilitators also identified instances of employee learning, which aligned with the understanding of learning organizations and organizational learning.

In improvisation, organizational learning takes place though an ensemble's development and the ensemble's goal of building better performances for a larger organizational purpose (Napier, 2004; Ronen, 2005). In a business context, improv facilitators worked with employees on becoming others focused and enhancing company skills together; as a result, improv in the performance arts and workplace learning context represented

examples of a learning organization (Senge, 1990). Organizational learning denotes employees engaging in meaning making and sharing information with the goal to advance the company (Senge, 1990). Improv facilitators worked with employees on developing meaning individually and collaboratively in a workshop through skill building and debriefs; however, the learning is for a company-determined goal. Improv for performance and workplace learning serves a larger organization role, which represents organizational learning. Additionally, as many businesses embrace competition rather than collaboration (Crossan, 1998), an improv facilitator working with employees on a team-focused culture cultivates a learning organization.

Learning organizations promote more knowledge developing from a team rather than an individual person (Senge, 1990). Participants echo this idea with their discussion of the improv tenet "bring a brick," which notes a project will progress further if everyone contributes small portions rather than one person trying to do it all. For this knowledge to enter into the realm of organizational learning, all parties must share the information for service of a company (Illeris, 2004; Senge, 1990). The integration of improv in organizational development requires individual employees to be willing and engaged, and the training should draw from organizational memory (Vera & Crossan, 2004).

Suggestions for Future Research

The incorporation of improvisation in workplace learning is not a new phenomenon (Bernard & Short, 2012; Koppett, 2001; Salinsky & Frances-White, 2008). Some participants noted a wider acceptance of the uses of improvisation in business, which indicates that previously, there was more resistance. The literature review revealed applications, necessary company proficiencies, and recommendations for incorporating improvisation into a company's organizational culture (Chelariu et al, 2002; Crossan & Sorrenti, 1997; Vera & Crossan, 2004). This integration represents a long-term initiative. The researcher suggested further research on company's long-term work with improv facilitators. It is unclear from this study how many companies currently repeat this form of training, but participants noted increasing interest, which leads to the opportunity for more long-term relationships with companies.

As improv proliferates within businesses, the researcher suggested studying the long-term effects of training using improvisation within a business. Long-term employment of improv facilitators in workplace learning provides an opportunity to observe the effects over an extended period of time, with regular company participants and documentation of the experiences of improv facilitators and employees. Additionally, evaluation surveys following each workshop collected by some improv facilitators provide data for document analysis. These surveys potentially shed light on employees' learning through improv over time. The literature review suggests studies examining improv's integration into an organization's everyday culture; as a result, a potential area of research includes the examination of long-term exposure to improv and the question of whether improv facilitators play a role in this process.

REFERENCES

Ahmed, E. W., & Al-Khalil, K. Y. (n.d.). The impact of using reflective teaching approach on developing teaching skills of primary science student teachers. *The Online Journal of New Horizons in Education. 3*(2), 58-64. Retrieved from https://www.tojned.net/journals/tojned/articles/v03i02/v03i02-07.pdf

Aylesworth, A. (2008). Improving case discussion with an improv mind-set. *Journal of Marketing Education, 30*(2), 106–115. doi: 10.1177/0273475308317703

Chelariu, C., Johnston, W. J., & Young, L. (2002). Learning to improvise, improvising to learn: A process of responding to complex environments. *Journal of Business Research, 55*, 141–147. doi:10.1016/S0148-2963(00)00149-1

Crossan, M. M. (1997). Improvise to innovate. *Ivey Business Quarterly, 62*(1), 36–42.

Crossan, M. M. (1998). Improvisation in action. *Organization Science, 9*(5), 593–599. Retrieved from http://dx.doi.org/10.1287/orsc.9.5.593

Crossan, M. M., & Sorrenti, M. (1997). Making sense of improvisation. In P. Shrivastava, A.S. Huff, J. E. Dutton, J. P. Walsh, & A.S. Huff (Eds.), *Advances in Strategic Management,* (pp. 155–180). Bingley, UK: Emerald Group Publishing.

Decuyper, S., Dochy, F., & Van den Bossche, P. (2010). Grasping the dynamic complexity of team learning: An integrative model for effective team learning in organization. *Educational Research Review, 5*, 111–133. doi:10.1016/j.edurev.2010.02.002

Echle, J. (1991). "Acting out" in the classroom: Improvisation in the curriculum. *Bread Loaf News*, *4*(3), 19–22. Retrieved from https://archive.org/details/ERIC_ED371424

Elsey, M. B. (2007). *The improvisational theater art form in theory and practice: A phenomenological study into the cognitive and affective dimensions of undergraduate students' education and learning.* (Unpublished doctoral dissertation). Northern Illinois University, DeKalb, IL.

FitzPatrick, S. (2002). The imaginary and improvisation in public administration. *Administrative Theory and Praxis, 24*(4), 635–655. doi:10.1080/10841806.2002.11029381

Halpern, C., Close, D., & Johnson, K. (1994). *Truth in comedy: The manual of improvisation.* Colorado Springs, CO; Meriwether.

Huffaker, J. S., & West, E. (2005). Enhancing learning in the business classroom: An adventure with improv theater techniques. *Organizational Behavior Teaching Society, 29*(6), 852–869. doi: 10.1177/1052562905277311

Husserl, E. (2012). *Ideas: General introduction to pure phenomenology.* New York, NY: Routledge.

Illeris, K. (2004). *Adult education and adult learning.* Malabar, FL: Krieger.

IMDb. (2015). *Whose line is it anyway?* Retrieved from http://www.imdb.com/title/tt2919910/

Johnson, R. B. (1976). Organization and management of training. In R. Craig (Ed.), *Training and development handbook: A guide to human resource development.* (pp. 1–17). New York, NY: McGraw-Hill.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* Englewood Cliffs, NJ: Prentice-Hall.

Koppett, K. (2001). *Training to imagine: Practical improvisational theatre, techniques to enhance creativity, teamwork, leadership, and learning.* Sterling, VA: Stylus.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage.

Maples, J. (2007). English class at the improv: Using improvisation to teach middle school students confidence, community, and content. *Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *80*(6), 273–277. doi:10.3200/TCHS.80.6.273-277

Mead, H. (1962). *Mind, self, & society: From the standpoint of a social behaviorist.* C. W. Morris (Ed.). Chicago, IL: The University of Chicago Press.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation.* San Francisco, CA: Jossey-Bass.

Miner, A. S., Bassoff, P., & Moorman, C. (2001). Organizational improvisation and learning: A field study. *Administrative Science Quarterly, 46*(2), 304–337. doi:10.2307/2667089

Napier, M. (2004). *Improvise scene from the inside out.* Portsmouth, NH: Heinemann.

Quintanilla, C. (1999, June 15). Corporate drones go off to improv class. *Wall Street Journal*. Retrieved from http://www.wsj.com/articles/SB929399237488981667

Rogers, C., & Freiberg, H. J. (1994). *Freedom to learn* (3rd ed.). New York, NY: Macmillan.

Ronen, A. (2005). *Directing improv: Show the way by getting out of the way*. New York, NY: YESand.

Saldana, J. (2009). *The coding manual for qualitative researchers.* Thousand Oaks, CA: Sage.

Salinsky, T., & Frances-White, D. (2008). *The improv handbook: The ultimate guide to improvising comedy, theatre, and beyond.* New York, NY: Continuum International.

Sawyer, R. K. (2004). Creative teaching: Collaborative discussion as disciplined improvisation. *Educational Researcher, 33*(2), 12–20. Retrieved from http://www.jstor.org/stable/ 3699971

Schon, D. A. (1987). *Educating the reflective practitioner*. San Francisco, CA: Jossey-Bass.

The Second City. (2014). *Corporate training*. Retrieved from http://www.secondcity communications.com/training/our-story/

Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York, NY: Doubleday.

Smith, R. M. (1982). *Learning how to learn: Applied theory for adults.* Chicago, IL: Follett.

Spolin, V. (1999). *Improvisation for the theater* (3rd ed). Evanston, IL: Northwestern University Press.

Vera, D. & Crossan, M. (2004). Theatrical improvisation: Lessons for organizations. *Organization Studies, 25*(5), 727–749. doi: 10.1177/017084060404212

Vera, D. & Crossan, M. (2005). Improvisation and innovation performance in teams. *Organization Science, 16*(3), 203–224. doi: 10.1287/orsc.1050.0126

Vygotsky, L. S. (1993). Interaction between learning and development. In M. Gauvain & M. Cole (Eds.), *Readings on the development of children* (pp. 34–40*)*. New York, NY: Freeman.

Zaunbrecher, N. J. (2011). The elements of improvisation: Structural tools for spontaneous theatre. *Theatre Topics*, *21*(1), 49–59. doi: 10.1353/tt.2011.0015

DEVELOPMENT AND VALIDATION OF WEB-BASED COURSEWARE FOR JUNIOR SECONDARY SCHOOL BASIC TECHNOLOGY STUDENTS IN NIGERIA

ANUNOBI, Vivian Njedeka
Information Technology Service, Federal University of Technology, Minna, Nigeria
annunobi@futminna.edu.ng

GAMBARI, Amosa Isiaka
Educational Technology Department, Federal University of Technology, Minna, Nigeria
gambari@futminna.edu.ng

ALABI, Thomas Omotayo
Educational Technology Department,
Federal University of Technology, Minna, Nigeria

ABDULLAHI, Mohammed Bashiru
Computer Science Department, Federal University of Technology, Minna, Nigeria

ABSTRACT
This research aimed to develop and validate a web-based courseware for junior secondary school basic technology students in Nigeria. In this study, a mixed method quantitative pilot study design with qualitative components was used to test and ascertain the ease of development and validation of the web-based courseware. Dick and Carey instructional system design model was adopted for developing the courseware. Convenience sampling technique was used in selecting the three content, computer and educational technology experts to validate the web-based courseware. Non-randomized and non-equivalent Junior secondary school students from two schools were used for field trial validation. Four validating instruments were employed in conducting this study: (i) Content Validation Assessment Report (CVAR); (ii) Computer Expert Validation Assessment Report (CEAR); (iii) Educational Technology Experts Validation Assessment Report (ETEVAR); and (iv) Students Validation Questionnaire (SVQ). All the instruments were face and content validated. SVQ was pilot tested and reliability coefficient of 0.85 was obtained using Cronbach Alpha. CVAR, CEAR, ETEVAR were administered on content specialists, computer experts, and educational technology experts, while SVQ was administered on 83 JSS students from two selected secondary schools in Minna. The findings revealed that the process of developing web-based courseware using Dick and Carey Instructional System Design was successful. In addition, the report from the validating team revealed that the web-based courseware is valuable for learning basic technology. It is therefore recommended that web-based courseware should be produced to teach basic technology concepts on large scale.
Keywords: Development, Validation, Web-based Courseware, Basic Technology, Sustainable Development

INTRODUCTION

The role of science and technology for any nations cannot be overemphasized. It is very important to note that without the knowledge of basic technology, Nigeria as a nation might be left behind in the scientific and technological race (Okonjo, 2012). Nigerian government realized the paucity of technology for national development and this made her to integrate basic technology into Junior Secondary School curriculum (FRN, 2013). One of the major objectives of basic technology is to enable the individual student to acquire appropriate skills, abilities and competence to live and contribute effectively to the development of his society (NERDC, 2006). To achieve this objective, there is the need for adequate commitment in the teaching and learning of basic technology in Nigeria junior secondary schools in such a way that, students' poor performance in the subject will be eliminated.

Over the years, students' performance in basic technology has not been encouraging. Basic technology, like other science subjects, recorded poor students' performance both in internal and national examinations. Many factors contributed to the poor performance of students in basic technology examination (Akale, 1986; Olorundare, 2011). These factors include; inability of the teachers to put across the concepts to the students, lack of skills and competence required for teaching, shortage of qualified basic technology teachers, lack of teaching materials and necessary equipment. The causes of poor performance have been attributed to lack of interest in

the subject or lack of understanding of the subject due to its abstractness as a result of poor school infrastructure, poorly equipped workshops, non-availability and utilization of instructional materials, lack of qualified personnel (teachers and workshop assistants), and poor instructional strategies (Oyelekan, & Olorundare, 2009; Gambari, 2010).

Globally, solutions to existing problems have been a trend in instructional activities. Efforts are therefore necessary to find solutions to the numerous problems encountered in teaching and learning processes. In the quest of seeking for systemic solutions to students learning problems, Educational Technology which is all about imparting knowledge using ICT tools could be of help, hence, new educational technologies such as game-based learning, mobile learning, web-based instruction, among others could shift the teacher-centered and learning environment to a student-centered environment that is more beneficial (Association for Educational Communications and Technology, AECT, 2007). Web-based instruction (WBI) is becoming a favored training option in industry, government, and education.

For the purposes of this review, online instruction is referred to as Web-based instruction. The web-based learning is relatively new in Nigerian public secondary schools. WBI is a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported. WBI is delivered via the computer using the Internet, making it capable of instant updating, distribution, and sharing of information (Khan, 2011).

Web-based instruction encompasses the integrated design and delivery of instructional resources via the World Wide Web and promotes students' engagement with text-based, hypermedia, multimedia, and collaborative resources for the purposes of teaching and learning (Bhagat., Wu, & Chang (2016). Nigeria has joined the global race in the growth and usage of ICT (FRN, 2004; Salami, Lagbe & Usman, 2008). This is evident by the growth in the use of the internet and the adoption of computer in schools. For instance, there is a proposed MTN Education bundle (a laptop) pre-loaded with rich educational content specially designed for children from pre-Primary to senior Secondary. Similarly, the 'Opon-Imo' is an e-learning computer tablet which comprises the entire educational needs of students in the Senior Secondary School classes. It is said to have 63,000 e-books, covering 17 subjects, a whole English dictionary, video tutorials, past questions for the last 10 years and lots more. It is an ICT innovation by the Osun State government.

World Wide Web is a small part of the internet. It is made up of the web pages that can be seen when connected to the internet. All web pages on the internet will have an address prefixed by www. The World Wide Web (the web) is not separate from the internet; instead it makes it to be more efficiently easy to use (Bhagat., Wu, & Chang, 2016). Web-Based Instruction is teaching and learning supported by the attributes and resources of the Internet. Web-Based Instruction offer one of the robust learning environments for complex text, graphical, and voice-based social interactions and experiences. The World Wide Web can be used to provide instruction and instructional support. Web-based instruction offers learners unparalleled access to instructional resources than the traditional classroom. It also makes possible learning experiences that are open, flexible, and distributed, providing opportunities for engaging, interactive, and efficient instruction (Khan, 2011). Effective online learning is dependent upon the principles of instructional design and development.

The design of web-based instruction must take into account cognitive processing of information, learning tasks, the learner, and an instructional tool (Cassarino, 2003). To support learning, the design of the online learning environment requires a shift in focus from content-delivery to a task-based instructional approach with opportunities for reflection and collaboration (Singh, 2009).

In this study, Dick and Carey instructional design model was used in developing the web-based courseware. Several instructional models were developed to achieve the same goal. For instance, Singh (2009) study suggested that using a systematic approach such as ADDIE to develop a valid and effective interactive web-based module was still viable. Similarly, Laleye (2016) adopted the design model provided by Ina, Fourie in (1994) and the social constructivist learning theory. The adopted model allowed development of the package to take less time and effort as it starts with specific set of prescribed objectives. In addition, Nugent, Soh & Samal

(2006) conducted a study on Design, Development, and Validation of Learning Objects. Results confirmed that the use of modular Web-based learning are a viable object can be successfully designed and used for independent learning.

Studies of the web-based learning environments have shown that development and validation
Laleye (2016) carried out a study on development and validation of a computer- assisted instructional package for learning basic science in Nigeria. The overall reaction from the validating team revealed that the developed package (CAIP) is valuable for learning physics concept in Basic science. Similarly, Özkök (2013) conducted a study designed to test the validity and reliability of the Web-based Learning Environment Instrument (WEBLEI). The findings evidence that the WEBLEI is valid and reliable measure of Turkish students' perceived web-based learning environments traits. In a similar study, Fakomogbon, Shittu, Omiola, and Morakinyo (2012) conducted a study on design, development and validation of a web-based instructional package for teaching ceramics concepts in basic technology for junior secondary school students in Nigeria. The results revealed that comments received from experts and student representatives confirmed that the content, navigation mode, interactivity, structure, colour used and authoring tools used were relevant and it was of good quality for the intended users. Thongmee, Ruangsuwan, and Terdtoon (2015). Development of web-based learning environment model to enhance cognitive skills for undergraduate students in the field of electrical engineering. The results of model implementation efficiency revealed that students who studied by using the developed web-based learning environment model received pre-and post-points of – achievement (52.37 and 92.40%). It was assumed that the web-based learning environment model had its quality at the highest level and could be used as a pedagogical tool for undergraduate students. In a similar study conducted by Salve-Opina (2014) on the development and validation of online learning modules for college English. The results show that the students exposed to the online modules in online portals performed better than those receiving traditional instruction in a classroom. In an overall perspective, the students were to a large extent satisfied with online instruction.

However, Obdeiin, Alewiinse, Mathoulin, Liverneaux, Tuiithof, and Schiiven (2014) developed and validated a computer-based learning module for wrist arthroscopy. The study revealed that the computer based module did not enhance learning, the participants did find the module more pleasant to use. Developing learning tools such as this computer-based module can improve the teaching of wrist arthroscopy skills.

In spite of the increased popularity and adoption presence of web-based learning opportunities, there is a limited study on students' development and validation of web-based learning environments in Nigeria. However, in order to promote active engagement of the learners and delivery of meaningful learning in the web-based learning settings, it is necessary to develop and validate a web-based courseware for teaching basic technology at junior secondary school level in Nigeria.

Statement of the Problem

Presently, Nigeria is like many other developing nations across the globe facing rapid increase in adoption of computers, networks and web technology. Due to the more feasible application of the web-based learning for supporting teaching and learning, most Nigeria private secondary schools and some few public schools have adopted the web-based technologies to support their traditional learning environments. For a shift from teacher-centered learning environment practiced by teachers which is one of the factors attributed to poor performance among secondary school students, there is need for improvement in teaching and learning. Hence, the quest for more effective instructional strategies like web-based instruction, virtual learning, and mobile learning among others. Web-based instruction as one of the student-centered strategy is yet to be imbedded in teaching and learning in Nigerian classrooms.

Web-based instruction can be used to transform classroom instruction into a series of rich memorable experiences and thus, reduce boredom and forgetfulness in teaching subjects such as Basic Technology. There is therefore need to develop and validate web-based instructional courseware for basic technology in Nigerian secondary schools.

Aim and Objectives

The aim of this study is to develop and validate web-based courseware for junior secondary school basic technology students in Nigeria. Specifically, the study sought to:

(i) determine the steps involved in developing web-based courseware for junior secondary school basic technology students in Nigeria.

(ii) find out how the developed web-based courseware for junior secondary school basic technology students in Nigeria was validated.

Research Questions

The following research questions were raised to guide the study:

(i) What are the steps involved in the development of web-based courseware for junior secondary school basic technology students in Nigeria?

(ii) How was the developed web-based courseware for junior secondary school basic technology in Nigeria validated?

RESEARCH METHODOLOGY

Research Design

This study adopted instrumentation design (ID) which involves design, development and the validation of the instruments needed for certain implementation in science, technology, industry and medicine (Lyons&Seow, 2000). Instrumentation in this study is on the realization of a teaching tool which can be tested and assessed to check if the design really solved problem that brought its development. The design of this study fits into the definition of instrumentation given by the International Centre for Educational Evaluation (1982) which states that a study belongs to instrumentation research if it is aimed at developing new, modifying content, procedure, technology or instrument of educational practice. In addition, a mixed method quantitative pilot study design with qualitative components was used to test and ascertain the ease of development and validation of the web-based courseware.

Sample and Sampling Technique

The population for this research consists of basic technology teachers, industrial and technology education lecturers, computer experts, educational technology experts and JSSIII students in secondary schools in Minna, Niger State. Convenient sampling technique was used to select three senior lecturers from Industrial and Technology Education Department, Federal University of Technology, Minna and three senior basic technology teachers from three secondary schools in Minna to validate the content of the basic technology for junior secondary school Class three (JSSIII). Purposive sampling technique was adopted to select three experienced computer programmers from Computer Science and Cyber Security Departments and three Educational Technology lecturers from Educational Technology Department, Federal University of Technology, Minna. Furthermore, simple random sampling technique was used to select 83 junior secondary school students from Peace Secondary School, Minna(n = 41) and St. Clement Secondary School, Minna (n = 41) for field trial validation of the web-based courseware (WBC).

Research Instruments

Four research instruments were employed in conducting this study: (i) Content Validation Assessment Report (CVAR); (ii) Computer Expert Validation Assessment Report (CEAR); (iii) Educational Technology Experts Validation Assessment Report (ETEVAR); and (iv) StudentsValidation Questionnaire (SVQ).

(i) Content Validation Assessment Report (CVAR): This instrument contains eight statements which respondents were required to write their comments after using the web-based courseware. These include: appropriateness of the WBC for teaching the choosen topics; clarity and simplicity of the WBC; suitability for the level of the students; the extent to which the contents cover the topics; possible errors in the suggested answers; the structuring of the WBC; and other comments on the grammatical errors, misrepresentation of the symbols in the WBC, among others. Furthermore, a space for free comments was also provided. This instrument was given to three senior lecturers from Industrial and Technology Education Department, Federal University of Technology, Minna for face and content validation of the web-based courseware for basic technology with regards to the officially prescribed content of National Education Research and Development Council's

(NERDC) curriculum.

(ii) Computer Expert Validation Assessment Report (CEAR): This instrument contains nine statements which respondents were required to write their comments after using the web-based courseware. These include: Appropriateness of the programming language used; typography errors in the WBC; legibility of the WBC; the navigation; theinterface; the animations in the WBC; functionality of the WBC; the storage, speed and durability of the WBC; and the appropriateness of the applications in the WBC. CEAR was given to three (3) lecturers from Computer Science and Cyber Security (programmers)Departments, Federal University of Technology, Minna for experts'validation after they had gone through the web-based courseware.

(iii) Educational Technology Expert Validation Assessment Report (ETEVAR): This instrument consists of seven statements which respondents were required to write their comments after using the web-based courseware. These include: suitability of the WBC for instruction; clarity and simplicity of the WBC; unity among illustrations; emphasis on key concepts; the use of colours (background and font colours); the legibility of the text (font type and size); and others such as audibility of the audio, animation, etc. ETEVAR was given to three (3) educational technology experts from Educational Technology Department, Federal University of Technology, Minna for the purpose of finding out whether the web-based courseware conforms with acceptable standards in educational technology.

(iv) Students Validation Questionnaire (SVQ): The instrument contains six section (A-F) and each section contains five statement items which respondents were required to state whether they are strongly agreed, agreed, disagreed, strongly disagreed respectively. Section A contains five-item on content in the WBC; section B has five-item on interactivity of the WBC; Section C consists of five-statement navigation of the WBC; Section D contains five-item on feedback from the respondents after using the web-based courseware; Section E has five-item that deals with screen design of the web-based courseware; while Section F contains five-statements on students' preferences toward the use of the web-based courseware to traditional method of teaching.SVQ wasadministered on 83 students who were randomly selected for field trial validation of web-based courseware for basic technology.

Method of Data Collection

Data were collected in two ways using qualitative and quantitative methods. Qualitative data on web-based courseware were collected from Industrial and Technology Education lecturers, Basic Technology Teachers, Computer programmers, Educational Technology experts. The experts responded to statements in: (i) Content Validation Assessment Report (CVAR); (ii) Computer Expert Validation Assessment Report (CEAR); (iii) Educational Technology Experts Validation Assessment Report (ETEVAR) respectively. The quantitative data were also obtained from 83selected students using Students Validation Questionnaire (SVQ).

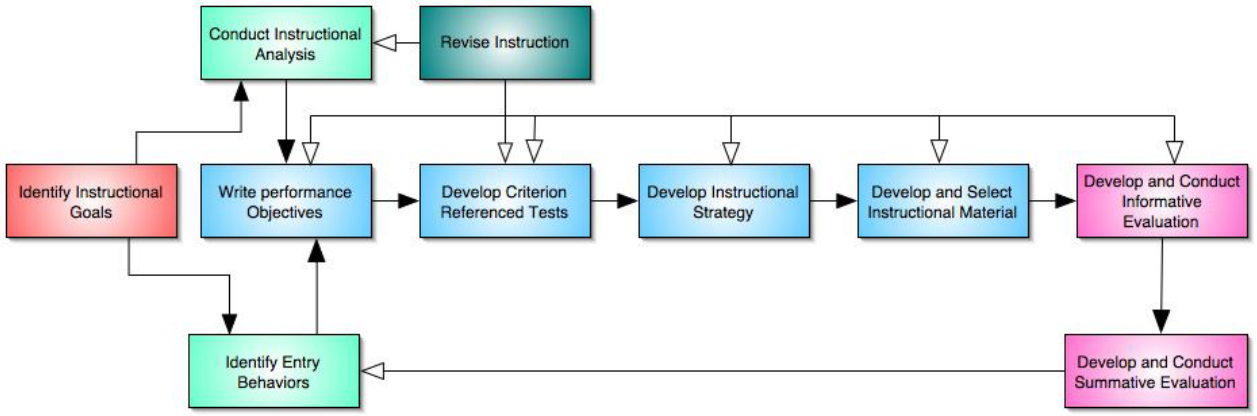
Data Analysis Technique

Research question one was answered by explaining the steps involves in developing web-based courseware. Research question two was answered using qualitative data and quantitative data. The summary of comments and recommendations from experts on validation were reported, while responses fromstudents from field trail validation were analyzed using descriptive statistics of mean and standard deviation.In taking decision from the analyzed data, an average mean of 2.50 and above were considered as agreed, while an average mean of 2.49 and below was considered disagreed with respect to the research questions. A mean of 2.5, according to David (2005), was used as a criterion to judge mean scores for a modified four- point item format. The mean of 2.5 was calculated from the sum of 4+3+2+1 divided by 4.

RESULTS

Research Question One: What are the steps involved in the development of web-based courseware for junior secondary school basic technology students in Nigeria?

This studyadopted the ten steps of instructional design as provided by the Dick and Carey model (2005) as shown in Fig. 1.



Dick and Carey Instructional Design Model

This model is based on a systems approach for designing instruction. It views instruction as an entire system, centering more on the interrelationship between context, content, learning and instruction. The model has nine major process components i.e. nine basic steps in an iterative cycle and a concluding evaluation of the effectiveness of the instruction. The nine components in an iterative cycle include:

(i) Assess needs to identify instructional goal(s);
(ii) Conduct instructional analysis;
(iii) Identify entry behaviour;
(iv) Write performance objectives
(v) Develop assessment instrument;
(vi) Develop instructional strategy;
(vii) Develop and select instruction;
(viii) Design and conduct formative evaluation;
(ix) Revise instruction; and
(x) Design and conduct summative evaluation (Dick & Carey, 2005).

Stage 1: In assessing the needs to identify instructional goal(s), three basic technology teachers and researchersidentified the difficult topics in Junior Secondary School class three (JSSIII) Basic Technology. Over dependent on teacher-centered approach of teaching and lack of using Internet for teaching and learning were identified as one of the problems for poor performance at JSS level. Hence, the need for developing web-based learning.

Stage 2: In conducting the instructional analysis, methods of instructional delivery for teaching basic technology at junior secondary school level were identified. This include the facilities, equipment, manpower and infrastructure available for instructional purposes.

Stage 3: In identifying entry behavior, the previous knowledge of the JSS III students must be identified. Concepts of basic technology taught at junior secondary class two (JSSII) were identified. Students were examined on their previous knowledge on some related concepts in basic technology.

Stage 4: In writing the performance objectives, the topics identified were structured from simple to complex, known to unknown, abstract to concrete. In this study, the objectives for each topic were formulated.

Stage 5: In developing assessment instrument, various instruments were used to determine the functionality of web-based courseware. In this study, (i) Content Validation Assessment Report (CVAR); (ii) Computer Expert Validation Assessment Report (CEAR); (iii) Educational Technology Experts Validation Assessment Report (ETEVAR); and (iv) Students Validation Questionnaire (SVQ) were developed.

Stage 6: In developing instructional strategy, justification for using web-based instructional courseware were identified. The necessity for developing web-based instructional courseware was based on the fact that the

available web-based courseware on the Internet were not directly relevant to the concepts of this study as they are not culturally relevant to basic technology instruction in Nigeria. Hence, there is need to develop web-based courseware.

Stage 7: In developing and selecting instruction for web-based courseware, the researchers identified the content of a web-based instruction, typed the JSS III basic technology course material, develop the storyboard and forwarded it to the programmer. The computer programmer determined the types of web pages to be used, identified the equipment and software for design and development of a web-based instruction. In this study, Macromedia Dreamweaver, Macromedia Fireworks, PHP programming language and MYSQL software were used for creating database. At the completion of the web-based courseware, programmer identified a host company to help store the file at the remote server and finally hosted the website.

Stage 8: In designing and conducting formative evaluation, various validation stages were employed. This include: content validation, experts' validation, one-to-one student validation, small group validation, field trial validation among others.

Stage 9: This stage involved revising the instruction, each steps were revised and all the necessary amendment were made based on validation assessment reports from experts and students. The researcher checked the entry behavior again and follow the loop again until the web-based courseware met the standard.

Stage 10: The final stage of Dick and Carey Model is designing and conducting summative evaluation (Dick & Carey, 2005). This involve the testing of the final product with the end users.

Research Question Two: How was the developed web-based courseware (WBC) for junior secondary school basic technology in Nigeria validated?

The validation of WBC was done in three stages: (i) content validation (basic technology specialists), (ii) experts validation (computer programmers &educational technology experts), and (iii) field trial validation (students' representative).

(i) Content Validation: this was divided into two stages: (a) content validation of the course material, (b) content validation of web-based courseware.

(a) Content Validation of the Course Material: After developing the contents of selected difficult concepts in basic technology, three senior basic technology teachers were given the content to validate using Content Validation Assessment Report (CVAR). They assessed the appropriateness of the web-based content for teaching the topics, clarity and simplicity of the contents, suitability for the level of the students, the extent to which the contents cover the topics they are meant to cover, possible errors in the suggested answers, the structuring of the WBC among others before the WBC was developed. They ascertained that the contents complied with NERDC curriculum. They also ensured that all question items were derived from the contents.

(b) Contents Validation of Web-based Courseware: The contents of the courseware were validated by three senior lecturers from Industrial and Technology Education, Federal University of Technology Minna using Content Validation Assessment Report (CVAR). They examined the contents of the WBC whether it adequately and sufficiently cover the Nigerian secondary school Basic Technology curriculum. After the validation, some sentence errors, spelling mistakes, and misrepresentation of some symbols in the web-based courseware were corrected. Some paragraphs and formatting errors were discovered and corrected. The test items and contents of the web-based courseware were also corrected based on the suggestions and recommendations of the experts.

(ii) Experts Validation: this was done in two stages: (a) Computer Experts Validation, (b) Educational Technology Experts Validation.

(a) Computer Experts Validation: The developed web-based courseware was validated by three computer experts (from Computer Science and cyber Security Departments) to validate using Computer Expert Validation Assessment Report (CEAR).They examined the appropriateness of the WBC in terms of language, typography, legibility, navigation, interface, animations/video, functionality, packaging, and durability. Their suggestions and recommendations were used for modifying the web-based courseware.

(b) Educational Technology Experts Validation: Three Educational Technology experts from Educational Technology Department validated the web-based courseware by looking at: its suitability for instruction, simplicity, unity among illustrations, and emphasis on key concepts, colour use, and text. In addition, three basic technology experts and two basic technology teachers also validated the WBC in terms of its appropriateness for teaching the topics, clarity and simplicity of the WBC, suitability for the level of the students, the extent to which the contents cover the topics they were meant to cover, possible errors on the suggested answers, the structuring of the web-based courseware and others. Furthermore, comments and recommendations on font types and sizes were effected by changing the font type to legible one and increase the font size moderately. Also, some background colours that seem to be distractive were changed. All the experts' comments were used to improve the web-based courseware.

(iii) Field Trial Validation: The WBC was trial-tested on some 83 Junior Secondary School Basic Technology students from Peace Secondary School, Tunga and St. Clement Secondary school, Minna. The students were taught basic technology using WBC for three weeks using double period of 80 minutes' duration. They were allowed to connect to the website (www.basictechedu.com)using the password assigned to each student to log in. The purpose of field trial validation is to confirm the functionality of the web-based courseware. After three weeks of exposure to web-based courseware, 30-item Students' Validation Questionnaire (SVQ) was administered to the students exposed to web-based instructional courseware and retrieved immediately and analyzed as shown in Table 1-6.

Table 1: Content in the Web-based Courseware

S/No	Statement	Mean	SD	Decision
1	The messages in the web-based courseware are easy to understand.	3.62	0.53	Agree
2	The content of the web-based courseware has been well organized (arranged in order).	3.67	0.64	Agree
3	The diagrams/illustrations in the web-based courseware are very clear to me.	3.42	0.69	Agree
4	The examples used in the various sections of the lessons in the web-based courseware are relevant.	3.42	0.66	Agree
5	It was easy to understand the lesson because information was presented from simple to more difficult one.	3.38	0.81	Agree
	Cumulative Mean	**3.50**		

Decision Mean = 3.50

Table 1 shows the cumulative mean of 3.50 for students' opinions of the content in the web-based courseware. This implies that students agree that content in the web-based courseware are adequate. This is because the cumulative mean 3.50 is greater than the decision mean of 2.50.

Table 2: Interactivity of the Web-based Courseware

S/No	Statement	Mean	SD	Decision
6	It is easy to operate the web-based courseware with computer keys and icons.	3.67	0.56	Agree
7	This package permits me to repeat the section, enlarge animation, and exit the lesson at any time.	3.87	0.34	Agree
8	The frequent display of questions to the learners does not interrupt the learning process.	3.42	0.92	Agree
9	This package enables me to apply what I have learnt rather than memorize it.	3.67	0.56	Agree
10	This package allows me to discover information through active learning.	3.71	0.46	Agree
	Cumulative Mean	**3.67**		

Decision Mean = 3.67

Table 2 shows the cumulative mean of 3.67 for students' opinions of the interactivity of web-based courseware. This implies that students agree that the interactivity of the web-based courseware are adequate. This is because the cumulative mean 3.67 is greater than the decision mean of 2.50.

Table 3: Navigation of the Web-based Courseware

S/No	Statement	Mean	SD	Decision
11	From the main menu, learners are allowed to register his/her name.	3.91	0.29	Agree
12	The EXIT key enables me to exit from the lesson.	3.82	0.39	Agree
13	The PREVIOUS key enables me to revisit the previous section(s) of the lesson.	3.96	0.21	Agree
14	The NEXT key directs me to go to the next section of the lesson.	3.87	0.34	Agree
15	The OPTION keys allow me to select the correct option.	3.84	0.42	Agree
	Cumulative Mean	**3.88**		

Decision Mean = 3.88

Table 3 shows the cumulative mean of 3.88 for students' opinions on the navigation of the web-based courseware. This implies that students agree that the navigation of the web-based courseware are adequate. This is because the cumulative mean 3.88 is greater than the decision mean of 2.50.

Table 4: Feedback from the Web-Based Courseware

S/No	Statement	Mean	SD	Decision
16	This web-based courseware provides immediate feedback after selecting the option.	3.20	0.76	Agree
17	This web-based courseware displays the correct or wrong answer chosen with some sound.	2.62	0.91	Agree
18	This web-based courseware allows me to proceed to the next lesson only if the chosen answer is correct.	3.62	0.78	Agree
19	This web-based courseware terminates my activities if after three attempts I got the answer wrong.	1.80	1.08	Agree
20	This web-based courseware appreciates my efforts by congratulating me after completing the lesson correctly.	3.71	0.73	Agree
	Cumulative Mean	**2.99**		

Decision Mean = 2.99

Table 4 shows the cumulative mean of 2.99 for students' opinions on the feedback from web-based courseware. This implies that students agree that the feedback from web-based courseware are adequate. This is because the cumulative mean of 2.99 is greater than the decision mean of 2.50.

Table 5: Screen Design of the Web-Based Courseware

S/No	Statement	Mean	SD	Decision
21	The presentations of the information in the web-based courseware attract my attention.	3.80	0.40	Agree
22	The use of proper lettering (fonts) in terms of style and size make the information legible.	3.82	0.39	Agree
23	The colours used for the various presentations are quite appealing.	3.80	0.40	Agree
24	The quality of the text, images, graphics and video are interesting.	3.84	0.37	Agree
25	The animations (moving picture) in the web-based courseware assist in understanding the lessons better.	3.71	0.51	Agree
	Grand Mean	**3.79**		

Decision Mean = 3.79

Table 5 shows the cumulative mean of 3.79 for students' opinions on the screen design of the web-based courseware. This implies that students agree that the screen design of the web-based courseware are adequate. This is because the cumulative mean of 3.79 is greater than the decision mean of 2.50.

Table 6: Students' Preferences toward the Use of the Web-Based Courseware Compared to Traditional Methods of Teaching

S/No	Statement	Mean	SD	Decision
26	I prefer to learn Basic Technology with WBC with a teacher acting as a facilitator.	3.62	0.78	Agree
27	Learning Basic Technology with web-based is more preferable than using text books.	3.82	0.44	Agree
28	The activities provided in this web-based courseware are more effective compared to normal classroom instruction.	3.87	0.34	Agree
29	I will suggest to my friends to use web-based courseware in learning Basic Technology instead of textbooks.	3.69	0.56	Agree
30	I prefer the use of this instruction method than normal classroom instruction.	3.71	0.63	Agree
	Cumulative Mean	**3.74**		

Decision Mean = 3.74

Table 6 shows the cumulative mean of 3.74 for students' opinions on their preferences toward the use of the web-based courseware compared to traditional methods of teaching. This implies that students' preferences toward the use of web-based courseware compared to traditional methods of teaching are adequate. This is because the cumulative mean of 3.74 is greater than the decision mean of 2.50. Finally, students' responses to web-based instructional courseware were used to improve the courseware.

DISCUSSION OF FINDINGS

The steps in developing web-based was used to answer research question one. Findings on the steps in the development of web-based courseware for JSS basic technology in Nigeria showed that using instructional system design procedures by Dick and Carey (2005) in developing web-based courseware was successful. This finding is in line with the recommendations of Dick and Carey (2005) instructional design model. The finding is also in agreement with Singh (2009) study which suggested that using a systematic approach such as ADDIE to develop a valid and effective interactive web-based module was still viable. It also agreed with the finding of Lalaye (2016) who reported that adopted design model provided by Ina, Fourie in (1994) and the social constructivist learning theory take less time and effort as it starts with specific set of prescribed objectives. In addition, Nugent, Soh and Samal (2006) confirmed that the use of modular web-based learning is a viable object that can be successfully designed and used for independent learning.

Findings on how web-based courseware for basic technology in Nigeria can be validated was revealed that experts and students' validation reports were positive. This finding agrees with the finding of Laleye (2016) who reported that reaction from the validating team and students' field trial validation revealed that the development of computer assisted instructional package is valuable for learning physics concept in Basic science. The finding of this study also agrees with the finding of Özkök (2013) who revealed that the Web-based learning environment is valid and reliable measure of Turkish students' perceived web-based learning environments traits. This study' finding also agrees with the findings of Fakomogbon, Shittu, Omiola, and Morakinyo (2012) who designed, developed and validate of a web-based instructional package for teaching ceramics concepts for junior secondary school students in Nigeria. Their results revealed that comments received from experts and student representatives confirmed that the content, navigation mode, interactivity, structure, colour used and authoring tools used were relevant and it was of good quality for the intended users. In addition, this finding is in agreement with the finding of Thongmee, Ruangsuwan, and Terdtoon (2015) who revealed that web-based learning environment model enhanced cognitive skills for undergraduate students in the field of electrical engineering. The finding of this study also agrees with the finding of Salve-Opina (2014) who developed and validated an online learning modules for college English and found that students exposed to the online modules in online portals performed better than those receiving traditional instruction in a classroom.

However, this study contradicts the findings of Obdeiin, Alewiinse, Mathoulin, Liverneaux, Tuiithof, and Schiiven (2014) who reported that the developed and validated computer-based learning module for wrist arthroscopy did not enhance learning, and but the participants find the module more pleasant to use.

CONCLUSION

Literature revealed that there is few web-based learning courseware developed and validated to facilitate teaching and learning of practical-based science subjects particularly basic technology in Nigeria. This study demonstrated the steps in developing and various stages of validating a web-based courseware for basic technology in Nigeria. Adopting Dick and Carey Instructional System Design Model in developing web-based courseware was successful. In addition, contents specialist reported that the contents covered the required basic technology concepts. Computer programmers also affirmed that the programming language used, navigation, interface, animation, and others are in line with the standard of software development. Educational technology experts reported that simplicity, clarity, unity among illustrations, and emphasis on key concepts, colour use, and font type and sizes were adequate.

RECOMMENDATIONS

Based on the major findings of this study, the following recommendations were made:

1. Developers of web-based courseware such as online course module, learning courseware and computer package should ensure that Dick and Carey ISD Model or similar ISD Model is fully implemented. This will serve as a guide towards developing a quality web-based courseware;
2. Content specialists and experts' validation reports should be properly followed towards developing a standard web-based courseware.
3. Basic technology teachers should imbibe the spirit of using web-based courseware for teaching their students in order to enhance learning of technological concepts at junior secondary school level;
4. Web-based courseware is a team work, therefore web developers should involve subject specialists, computer programmers, educational technology experts, and students in the process of developing and validating web-based courseware to ensure high interactivity and users-friendliness of such courseware;
5. Secondary schools in Nigeria should embrace and support the use of web-based courseware in their schools as this will enhance students'performance in basic technology and science related subjects. Therefore, government and non-governmental organizations should provide ICT infrastructure for effective development and utilization of web-based courseware.

REFERENCES

Laleye, A. M. (2016). Development and validation of a computer- assisted instructional package for learning basic science in Nigeria. *Journal of Science, Technology, Mathematics and Education,* (JOSTMED), 12(1), 241-257.

Akale, M. A. G. (1986). *Assessment of students' achievement in science: What implications for teachers training.* Proceedings of the 27th Annual Conference of the Science Teacher Association of Nigeria (STAN).

Association for Educational Communications and Technology (AECT, 2007). *Educational technology: Definition and glossary of terms.* Washington D. C.: AECT.

Bhagat, K. K., Wu, L. Y., & Chang, C. Y. (2016). Development and validation of the perception of students towards online learning (POSTOL). *Educational Technology & Society, 19* (1), 350–359.

Cassarino, J. (2013). Which instructional design models are educators using to design virtual World Instruction? *Journal of Online Learning and Teaching,* 12(1).

Dick, W. & Carey, L. (2005). *The systematic design of instruction (4th Ed).* New York: Harper Collins College Publisher.

Fakomogbon, M. A., Shittu, A. T., Omiola, M. A., & Morakinyo. O. K. (2012). Design, development and validation of a web-based instructional package for teaching ceramics concepts in basic technology for the junior secondary school students in Nigeria. *Interdisciplinary Journal of Contemporary Research in Business, 3(10), 533 - 541.*

Federal Republic of Nigeria (2004). *Nigerian national policy on information technology (IT).* Retrieved February 12/2006 from http://www.nitda.gov/docs/policy/ngit policypdf.

Federal Republic of Nigeria (FRN) (2013). *National policy on education.* Abuja: NERDC.

Fourie, I. (1999). The use of CAI for distance teaching in the formulation of search strategies. *MOUSAI,* 17 (1), 48-75.

Khan, B. H. (2011). *The effectiveness of web-based instruction: An initial inquiry.* 7th International Conference on University Learning and Teaching.

Lyons, A. & Seow, P. (2000). *Design and technology.* Singapore: Addison Wesley Longman Pte Ltd.

NERDC (2006). *Nine - year basic education curriculum. Basic science and technology for upper basic education. JSS 1-3.* Abuja: NERDC.

Nugent, G., Soh, L. & Samal, A. (2006). Design, development, and validation of learning objects. *Journal Educational Technology Systems,* 34(3), 271-281.

Obdeiin, M. C., Alewiinse, J. V., Mathoulin, C., Liverneaux, P., Tuiithof, G. J. M., & Schiiven, M. P. (2014). Development and validation of a computer-based learning module for wrist arthroscopy. *Chirurgie de la Main, 33(2),100-105.*

Okonjo, I. N. (2012). *Science and technology: The key to Nigeria's transformation.* An Unpublished Speech delivered at the 2nd Brennial Lecture Series at the Enugu State University of Science and Technology.

Oyelekan, O. S., & Olorundare, A. S. (2009). Development and validation of a computer instructional package on electrochemistry for secondary schools in Nigeria. *International Journal of Education and Development using Information and Communication Technology (IJEDICT), 5(2), 88 - 104.*

Özkök, G. A. (2013). Reliability and validity of the Turkish version of the web-based learning environment instrument (WEBLEI). *Journal of Education*, 28(2), 335-347.

Salami, A. A., Lagbe, S. I. & Usman, R. S. (2008). *Principle and practice of educational technology.* Ilorin: Integrity Publications.

Salve-Opina, A. (2014). The development and validation of online learning modules for college English. *American International Journal of Contemporary Research, 4(2), 89 - 97.*

Singh, O. B. (2009). *Development and validation of a web-based module to teach metacognitive learning strategies to students in higher education.* Graduate Theses and Dissertations. http://scholarcommons.usf.edu/etd/20

Thongmee, L. T., Ruangsuwan, C. & Terdtoon, P. (2015). Development of web-based learning environment model to enhance cognitive skills for undergraduate students in the field of electrical engineering. *Educational Research and Reviews,* 10(21), 2806 – 2813. DOI: 10.5897/ERR2015.2470. http://www.academicjournals.org/ERR

EFFECT OF HERO CONCEPT IN FOLKLORE MATERIAL ON STUDENT'S RESPONSE IN ADDRESSING STUDENT BRAWLS

Nazla Maharani Umaya, M.Hum.
Doctoral Student of Sebelas Maret University, Surakarta, Central Java, Indonesia.
(nazla.tyaga@gmail.com)

Prof. Dr. Sarwiji, M.Pd.
Lecturer of Sebelas Maret University, Surakarta, Central Java, Indonesia.
(sarwijiswan@staff.uns.ac.id)

Prof.Dr. Budiyono, M.Sc.
Lecturer of Sebelas Maret University, Surakarta, Central Java, Indonesia.
(budiyono53@yahoo.com)

Prof. Dr. Andayani, M.Pd.
Lecturer of Sebelas Maret University, Surakarta, Central Java, Indonesia.
(bu_anda09@yahoo.co.id)

ABSTRACT
This article contains the result of a thorough exploratory study on the effect of hero concept in folklore material on local student brawls and an experiment a new concept of folklore material in Semarang, Central Java, Indonesia. The following result can be applied as a local analysis which can be met in many places with flexible and contextual solutions. The method used is a mixture of exploration and quasi-experiment.The discussion includes the character involvement of teenagers aged 12-15 years old, students, teaching material in learning activities, components of hero concept, and its role in finding solutions to overcome student brawls. The hypothesis of the study is the level of acceptability that hero concept in teaching materials affects the increase of the positive behavior and opportunities reducing the number of student brawls.
Keywords: Teaching material, hero concept, behavior, student brawl, folklore utilization, and learning.

INTRODUCTON

Universally, exploratory study can be applied as an alternative discourse in solving a similar problem in different locations such as student brawl. The hero concept topic in teaching material and the student brawl universally can be met in many countries. As it appears in the news, "Crowd of students brawls Downtown in Pittsburgh" (Czebiniak, 2016), or "China officials 'investigate classroom brawl' in Anhui province" (editorial, 2016), or "Prom after-party blamed for 40-student brawl at L.A. high school" (Blake, 2016), and many. The student brawl is connect with what they understand, especially about to be like a hero. Thinking invincible, brave, tough, but with the wrong way. A proper strategy is necessary in the presentation of the teaching material component as to help reduce the number of student brawls through learning activities.

The limitation of teaching material topic is the teaching material for teenager students aged 12-15 years old in learning activities at school. The teaching material perception is specified into folklore material. The applied basic reference is that folklore is a literature work which comes from oral literature and which is effectively used to communicate a phenomenon with style, esthetic, and moral value because it comes from a life or phenomenon which does not actually happen but is meaningful (Danandjaja, 1994, p 86). Thats mean, learning activities based on community act can use or utilize folklore. The basic of limitation is that the learning process of students (aged 12-15 years old) affects the character development, which is related to the various problems in their group. As one of the examples, the collection of information from various researches shows that there was an intense influence of the behavior of watching Korean movies on Indonesian female teenagers' dressing style in Surakarta, Central Java (Ginari, 2012, p. 70). The result of analysis on the questionnaire of behavior of 90 randomly-sampled students of State Junior Secondary School of Semarang shows that the students considered the figures that they had met in folklore material as mere legendary figures and a to-be-known legacy from their previous generations. One device dynamic learning that can use in school, and always can be developed adjust the context and needs for learning is on the learning material.

METHOD

The method used in the study is a mixture. Study exploration is performed to find the link between the effect of learning activities and student behavior outside of school. A data source is a group of students who are

determined randomly. Acquire techniques to conduct interviews, the spreadsheet questionnaires, and observations. Exploration component units are learning in the classroom and the use of the device, activity in schools outside school hours, and activity around the school.

The other part is doing the analysis of the concept of heroism contained in learning materials on subjects used folklore and the folklore examples provided in the regional community. The technique is performed the content analysis. Data obtained in the form of diverse concepts of heroism which is used as source material for modifying and developing new models presenting the concept of heroism in learning materials folklore. The output stage of the data obtained information regarding the level of students' understanding of the concept of heroism is learned, report observations in the classroom use of the materials on which the functioning of modifications, and information about the various student responses after obtaining knowledge of the concept of heroism against the action brawl between students. All of these data into a level explanation effect of hero concept in folklore material on student's response in addressing student brawls.

The entire series is exactly what we call the mixed method, mixed method adapted from understanding the exploration of which is included in the exploratory mixed methods (Creswell, 2008, p. 561). The method serves to generalize more than one thing that can represent a particular theory (Best & Kahn, 2006, p. 259). Empirical generalizations about the impact of the concept of heroes in learning materials with the understanding of the battle that gives effect to the students as one of the perpetrators of student brawls. Analysis of the concept of heroism on the content of the subject matter that is used. The results of the test material effect on the character development and the development of the concept of thought on the matter. Test the ability to interact can be done with a test that includes information actions and student responses to certain issues as a form of character education that influence student behavior habits (Thompson, 2002, p. 76). Determination of the preferred method of use refers to statements regarding the formation of character, which character development basically forms a new thing, but forming the basis of the character with the character of the existing or student owned (Nucci, Larry P.; Narvaez, Darcia, 2008, hal. 91).

RESULT AND DISCUSION

The results of an exploratory study on the relationship between the activities of the students to learn in school with behavior outside the school obtained in three different types of data forms. Interviews were conducted on students who are determined based on the recommendation of their teachers who categorize the student is a special student. Special category consists of the top prize winners in the classroom, students are extra active, quiet students, and students who have a lot of records violations in school and outside of school. Data from 30 students in one class the information obtained, there are 3 students with high grades (rank), 2 students with behavioral extra active, 1 student reserved, and 6 students with a record of violations he had done at school and outside of school in the last six months. Interview topics is about what students doing when the teachers on teaching and not attracting, the part of the subject of folklore which is student likes, the part of the subject of folklore which is student dislikes, the concept of a hero which is understood on learning, the concept of heroes which can be applied in life, students opinions about the winners in the brawl between students, student opinion about the students who lose out on the brawl between students, and students opinions on the relationship of the concept of heroes in the lesson with their heroes in real life.

All the answer is on two category in these context, it could be connected or unconnected to the causes of the brawls of student. The result is the result is that there is a link between hero concepts covered in the subject matter to the students' understanding and the resulting response to the action brawl between students. The results on graphic (figure 1) of the use of the same material in a smart and reserved student has a chance 12-25% to get carried away in the case of brawl between students. while for the active student and did have a poor record at school have a 50-100% chance to get carried away and get into the action affected brawl between students that occur outside of the school environment. It indicates that the learning material influence on the activity outside the school performed by students.

For the aforementioned students, the intellectual development and awareness become the important part of their intellectual process. As stated by a prominent philosopher, JJ Rouseu, (1712) and referred to by Arthur (2003, p 60) in his book about education and character, Arthur claims that in the mentioned ages, children have an attitude inclination which is dominated by intelligence, practicality, awareness and self-prioritizing. One of the imitation objects is located in the scope of school. The result of the exploratory study shows that there were only 25% of the figures and characters met in folklores from the applied eleven types of teaching material. The folklore figures from the teaching material were presented from foreign countries, which were different from the student’s nationality (foreign and no proximities) and local legendary figures (which possibly interacted with

past events), which were difficult to understand, which were practically only for the means of reading and also far from belief of an idol or a role model.

Cognitively, the students will often enter the stage of logically thinking on various types of hypothesis and verbal problems and applying scientific reasoning as well as accepting others' perspectives, which all lead to formal operations (Piaget, 2003, pp. 162-165). As a matter of fact, every single thing that they learn is merely an activity inside the class. The existence of maturity, physical experience in activity environment, social interaction, also self-management system balance is unapplied. The figures that they find logically are not acceptable to be included as material component of self-character order establishment system.

Social context as the part of activity which can form an idea and trigger the presentation of the concept establishment toolkit has not been applied, which Bruner called as cultural toolkit. One of the examples is the culture of hand phone or laptop applications which ease them in finding the heroic figure from a more logic period of time for them to be accepted. The measure of the logic is the denial toward the past, not the future and the dream concept is more appropriate to be chosen as material. It functions as the concept structure for a new situation from the previous learning. The material they find in the teaching material still cannot be accepted for them in building a character which is applied in self-behavioral system toward the environment and the problems they experience. The possibility for teenagers in accepting solutions to overcome problems by impersonating wise kings in ancient times is less accepted compared to an action movie actors who overcome problems through fights.

Relation between the phenomenon and the learning process is the intellectual ability, learning, and rules and regulations or system. As stated in (Bruner, 1999, p. 33), there are three things which should be paid attention to in a learning process. They are the process of intellectual development, learning activity, and curriculum concept. The materials which are applied in the learning process for teenagers should possess proximity with the actual-personal experience. The activities in school become one of the chances to implement the manner of a personal experience establishment which can be realized. The learning activity has a chance of building the students' character for the future with the appropriate work instruction. The result of the content analysis in the language teaching material which includes the description of figures and characters for the students' learning in Semarang, Central Java, Indonesia shows that 78% of the guidelines and instructions did not direct the students in the application of attitude, knowledge, and skill related to the solving of the problems that they (teenagers) frequently encountered. Thus, it resulted in a product of teenage students who practically did not have a good grip on real life knowledge.

Data of the Central Java province government (Bp3ak) on handling the violence against children in Semarang, there was an increment on the amount of violence against children victims in 2015 with the range of average increment of 20% in each month during one year (Bp3ak, 2015). Ironically, this issue happened following the establishment of the character education component enforcement in 2013 curriculum. The learning process in school did not affect the students' character much. As stated in the article of the Commission for Indonesian Child Protection that the school factor in the majority of the students' daily activity was not considered as an institution which can provide an applicative moral education (Setyawan, 2014). The result of the exploratory study shows that several junior secondary schools did not provide character education leading to teenager's problems, but only provided hereditary advices. The other causal factor is the condition of the intellectual development on students aged 8-12 years old which aimed at building a character with an imitative act, tending to be influenced by an idol or a heroic figure (Sudarilah, 2014, p. 7).

The process of perception building in the decision-taking of personal behavior order system is unconsciously obtained in the guided school. In this process, an uncontrollable perception emerges. One of the educational chances related to the thinking system order about a character inside an idol or a heroic figure through the education processes of civics, religion, or language does not happen. In Indonesia, in accordance with the applied curriculum, there is a language education subject and Indonesian literature which aims at building the ability to communicate through the folklore or story learning. In the scope of local areas, the result of the exploratory study shows that the composition of compulsory teaching materials (established by the government since 2004) in the language and literature subject for junior secondary school students had unconsciously put a brake on the effort to develop the teaching materials, which included the solution for teenagers' problems toward teachers. With the compulsory books, there was a comparison between the presented various teaching materials and the number of the schools, where there were only 13% of the schools which were able to fulfill the students' learning needs, with the average of 1 type of teaching material in each school, while 70% of the teachers from almost the entire junior secondary schools with the average of 1 teacher per school did not modify the teaching materials they would use. This matter became the indicator of the absence of learning process, which led to the

role of local hero figure utilization or which was suitable to help establish the system of character building on the students. It was not possible to universally and effectively establish a heroic personality in affecting the students' behavior.

The assumption that children's individuality development on the age ranges of 12-15 years old claimed by Philosophers JJ Roseu (1712) and was referred to by Arthur on his book about the analysis of intelligence and critical education with character development (Arthur, 2003, p. 60) did not turn up practically and applicably. On the analysis of the content diversity of the learning material, there were many incompatibility issues between the content composition and the teenagers' need. 78% of the incompatibility led to graduate competency standards, namely: achievement, attitude, knowledge, and academic skills: reading, speaking, and writing skills. There were no scopes of graduate competencies which referred to the success of students' study result application in general social community, especially in responding the frequently occurred student brawls. It was all only limited by attitude-achievements reflecting one's attitude, faith, nobility, knowledge, confidence, and responsibility in interacting effectively with the social community and the nature in their reach or by conceptual-factual knowledge and procedure in science, technology, art and culture with the knowledge of humanity, nationality, statehood, and civilization related to visible phenomenon and event which all was literate in nature, but was not applicative. Students did not go through character development process in relation with directive imitation of an idol figure.

As both consideration and concrete evidence regarding to the composition of material related to the children's heroism from the idol, of the story compositions with the possibility to develop the individuality only 25% of all learning materials used were accommodated. The learning material provided with the needs of learning device which was able to develop students' character and to be the solution of student brawls in suppressing the number of cases shows that 89.5% of the students still needed the proper devices related to the learning of language and culture and also patriotism which could suppress the number of student brawls in personal and study group way. The fact is that there were some heroic figures in the learning material which was introduced in the form of folklore text like the sweet snow white, arrogant prince, and Maling Kundang the perfidious son. However, the personality component from each figure was not able to give material of personality to the children in building a new concept of personality in their attitude order system. Some of the factors found were as follows: there were repetitions in presenting the heroes, the heroes presented were not compatible with the student's environment, the were few references to strengthen the hero's character outside the text, and the instructions did not point to the applicative act on the students' discovery about the material of heroic character concept development.

According to the results of exploration and theoretical study, the locality transferred the heroic concept wrapped in local culture. There were 7 aspects of heroism found in local tales: belief in self power, keeping the spirit of struggle to independence, defending own land and home, never giving up, holding firm the inner and outer discipline, never breaking a promise, never betraying your people and religion. Those also departed from the concept of heroism claimed by Budiono (2007:216) in his writing about the value of Indonesian personality and struggle to independence. The core characteristic was then mapped in 30 forms of attitudes and personalities, namely: (1) Confidence in your own ability, (2) being independent, (3) being brave, (4) being humble, (5) caring, (6) being attentive, (7) having visions and missions, (8) teamwork, (9) being oriented, (10) having knowledge, (11) hardworking, (12) loving, (13) conservationist, (14) preserving and protecting, (15) having a sense of pride, (16) willing to sacrifice, (17) never giving up, (18) never being desperate, (19) always having an idea, (20) having a principle of life, (21) being strongly- determined, (22) being honest, (23) being discipline, (24) being consistent, (25) being on time, (26) being responsible, (27) being loyal, (28) being god-fearing, (29) being noble, (30) being highly dedicated, all can be used as the material to develop personality concept.

The education on heroic character did not appear dominantly in the said learning material. If it was to be related to teenagers' problems in social community, 89.5% of heroic personality material was irrelevant. One of the indicators was there was no utilization of local heritages in offering the characteristic element, but it tended to be universal. It became short-lived which created a big obstacle in implanting heroic comprehension which could prevent the students from the brawl with a proper perception. To compare, characteristic comprehension is within the brawlers who keep repeating their actions with pride or their caring attitude as the reason to join the brawl because of their solidarity. Even their willingness to sacrifice is as the pride for their group for winning the brawl.

Based on all the information and data we make modifications to the subject matter of folklore as a result of spreading the idea of the data analysis. we use one of the local epic story titled "Pirate Kertapati" Asmaraman work Kho Ping Hoo is known as one of the stories "silat" (martial arts fight is a traditional local) are popular in his time (in 1970) and currently works reprinted. To customize the story with the user's age and needs context

emphasized the concept of heroism, performed adaptation of the story. Produced four pieces of folklore connected with the essence scope and sequence of events has not changed. Adaptation aspects into account elements of language and social interaction variance components according to the age of readers (children 12-15 years). Like for example in terms of violence in combat, cunning strategy memorable. The fourth folklore being part of the subject matter in accordance with standard fittings components and learning materials that apply in the education system innovation on the material contained in the instructions and the instructions for use of the material. Bloom in taxonomic concept of transformation into an active form of instructions relating to the content of the folklore. Thus, Activities of learn despite using a work of fiction that is not real easy to apply by the students in the form that has been transformed. Determination instruction, based on the findings included in the concept of heroes such folklore. the concept of the concept is the hero will act confidently and hold fast to the truth, is someone who has the courage beyond the ordinary, seeing things in the form of high esteem, sensitivity to others who need assistance from it, acting in a planned and had obsession great to always realize his plans, in terms of good will to join any party without favoring one, altruistic than their own interests as a principle, always working and never give up, do not ruin the life and nature meets, doing things for others though tiring for goodness sake, say what it is, and always accept whatever he faced if indeed it is a must. All transformed in the form of instructions that lead students on a range of activities and can provide information on the effect of material on the behavior, namely Presentation, assessment and provision of opinions, assessment work of another person, group, innovate, delivery of the decision, the completion of the learning process overall, and polls.

CONCLUSION

The hero concept on the folklore learning material can be utilized as the alternative method for character development on the students in addressing the student brawls. The result was 6 main strategies related to the learning material and activities using hero concept to anticipate and suppress the student brawls with the success of character building on the secondary school students. Those strategies were as follows: (1) make sure that the learning material is only functionally and effectively used to local area boundaries but still bears a global quality; (2) the learning material used is a product of development and plan which is developed from the result of study on the students' characters of specific age range and which has also been linked relevantly with the local character culture to build closeness and easiness in comprehension process; (3) the material of character that utilizes the product of society has been modified and presented in the form which fits the era, like presenting a legendary literary art with its accompanying modernization version by using retelling or adaptation method; (4) the learning process, completed with instruction and working procedure, refers to material of character application that will be offered as a new development concept in the students personality and behavior. (5) Specify the limit of character achievement in reachable range and so remedial concept can be applied if it is not yet achieved; and (6) the activity of learning material utilization is done to develop students' awareness to respond any matters in their life.

Thus, the assumption that the hypothesis of hero concept in learning material can affect the behavior of student brawls is acceptable. Next, the creation of prototype and the experimentation in a form of sustainable research are done on the local and contextual area on the basis of research area situation analysis result. The learning material which is able to develop it will also be able to influence the students' motivation, especially in language learning (Sun, 2010, p. 890.) and to develop a specific character. The development of specific characters is appropriate because developing characters does not mean create any new thing, but develop the current characters according to the previously owned characters (Nucci, Larry P.; Narvaez, Darcia, 2008, o. 91). Adaptation with the previous characters of the student's is needed to develop characters by utilizing the learning material. The advancement of culture on the development of human mind relies on the society revolution of individual reality and experience that has been represented through the common spoken or written symbolism (Bruner, 1996). In Bruner's claim, the decision is based on the cultural context and conception before the learning participant takes it with them to a new situation as the result of previous learning in other context. A new learning is a product of "interaction" between them. The hero concept in learning material which has applied the strategy of learning material preparation can be made as the learning solution for the students in responding and dealing with the student brawls.

REFERECENCES

Arthur, J. (2003). *Education with Character.* London: RoutledgeFalmer 11 New Fetter Lane.

Best, J. W., & Kahn, J. V. (2006). *Research in Education: Tenth Edition.* USA: Person Education Inc.

Blake, A. (2016, May 11). *Washington Time*. Retrieved from The Washington Times, LLC: http://www.washingtontimes.com/news/2016/may/11/prom-afterparty-blamed-40-student-brawl-l-high-sch/

Bp3ak. (2015, februari minggu). *http://bp3akb.jatengprov.go.id/e_kekerasan_new/report.* Retrieved from http://bp3akb.jatengprov.go.id/: http://bp3akb.jatengprov.go.id/e_kekerasan_new/report

Bruner, J. (1999). *The Process of Education* (25 ed.). United States of America: The President and Fellows of Harvard College.

Creswell, J. W. (2008). *Educational Research; Planing, conducting, and evaluating quantitative and qualitatif research.* New Jersey: PearsEducationon, Inc,.

Czebiniak, M. (2016, May 17). *Local News*. Retrieved from trib live : http://triblive.com/news/allegheny/10486451-74/students-fight-police

Danandjaja, J. (1994). *Folklor Indonesia* (4th ed.). Jakarta: Pustaka Utama Grafiti.

editorial. (2016, April 21). *World Asia China News*. Retrieved from BBC: http://www.bbc.com/news/world-asia-china-36098749

Ginari, N. D. (2012). *Intensitas Menonton Korean Drama dan Fashion Remaja Putri di Surakarta.* Surakarta: Fisip Universitas Sebelas Maret.

Nucci, Larry P.; Narvaez, Darcia. (2008). *Handbook of Moral and Character Education* (1nd ed., Vol. 1). Oxon, New York and London: Routledge Taylor and Francis Group.

Piaget, J. (2003). *The Psychology of Intelligence.* London and New York: Routledge Classics.

Setyawan, D. (2014, Mei Rabu). *Komisi Perlindungan Anak Indonesia.* Retrieved from http://www.kpai.go.id/artikel/tawuran-pelajar: http://www.kpai.go.id

Sudarilah. (2014, Maret-April). *Jurnal Ilmiah Widya.* Retrieved februari minggu, 2016, from Jurnal Ilmiah Widya: http://download.portalgaruda.org/article.php?article=250270&val=6690&title=PERAN%20PENDIDIKAN%20DAN%20PENGAJARAN%20MORAL%20BAGI%20PESERTA%20DIDIK%20DALAM%20RANGKA%20MENGATASI%20TAWURAN

Sun, Z. (2010, November). Language Teaching Materials and Learner Motivation. *Journal of Language teaching and Research, 1*(6), 890.

GENDER DIFFERENCES IN ACADEMIC PSYCHOSOCIAL FACTORS ASSOCIATED WITH MATH ACHIEVEMENT

Ka-won Lee, ED.D
College of Education, Mokwon University
Daejeon, Korea
kwlee@mokwon.ac.kr

ABSTRACT
This study examined gender differences in influential antecedent learning factors that are associated with math achievement. Using the dataset extracted from the Educational Longitudinal Study of 2002, structural equation modeling yields three major findings: (a) social economic status (SES), educational aspiration for attaining an educational degree, total AP/IB math courses, and the degree of advanced math course taking are significantly related with math self-efficacy (p<. 001); (b) female students have better preparation in math through taking advanced math courses (p<.001) and have higher educational aspiration in obtaining advanced degrees (p<.001), while having significantly lower math self-efficacy than male students (p<.001); and (c) given the finding that female students have lower math achievement than male students (p<.001), math self-efficacy is the most critical antecedent learning factor for female students affecting math achievement. These results suggest that for female students, how to enhance math self-efficacy is a critical matter to improve math achievement.

INTRODUCTION

While a sufficient supply of knowledgeable and skilled science technology, engineering, and math (STEM) workers contributes to U.S. economic growth (U.S. Department of Labor, 2007), the number of knowledgeable and skilled STEM workers who have postsecondary degrees in STEM fields has decreased over the past decade (U.S. Census Bureau, 2010). One of the dire facts related to the shortage of STEM workforce is the minority status of female students in STEM fields. The NSF (2007) from the Bureau of Labor Statistics revealed that while the percentage of women in the labor force was 46.4, female engineers represented only 11.1 percent of all engineers. Also, the percentage of female mathematical and computer scientists decreased from 31.0 in 1983 to 25.6 in 2007, although the overall ratio of women in the workforce increased from 43.7 % in 1983 to 46.4% in 2007 (NSF, 2007). Thus, how to encourage female students to choose STEM college majors and careers is a prime matter for educators and policy makers. A wealth of literature indicates that math achievement is a significant factor for students to choose STEM major choice in college (Astin & Astin, 1992; Besterfield-Sacre, Arman, & Sgynabm 1997; French, Immekus, & Oakes, 2005; Levin & Wyekoff, 1998; Nicholls, Wolfe, Besterfield-Sacre, & Larpkiattaworn, 2007; Veenstra, C.P., Dey, E.L., & Herrin, G.D., 2008). Also, it is well documented that math self-efficacy is another critical factor associated with STEM major choices in postsecondary settings (Betz & Hackett, 1983; Hackett & Bets, 1981; Hackett & Betz, 1983; Hackett & Campbell, 1987; Hyde, Fennema, & Ryan, 1990; Lent, Lopez, Bieschke, 1991; O'Brien, Martinez-Pons, & Kopala, 1999). In general, self-efficacy is considered a predictor of students' academic achievement across academic areas and levels (Pajares & Urdan, 2006) as well as students' college major choice and career choices (Brown & Lent, 2006), which is well applied to the social cognitive career theory (SCCT). Conceptually framing the SCCT, several studies discovered the association of math achievement, math self-efficacy, and STEM major and career choices, paying particular attention to gender differences. However, few studies focus on how the antecedent learning factors, other than math self-efficacy, are associated with math achievement based on a large scale.

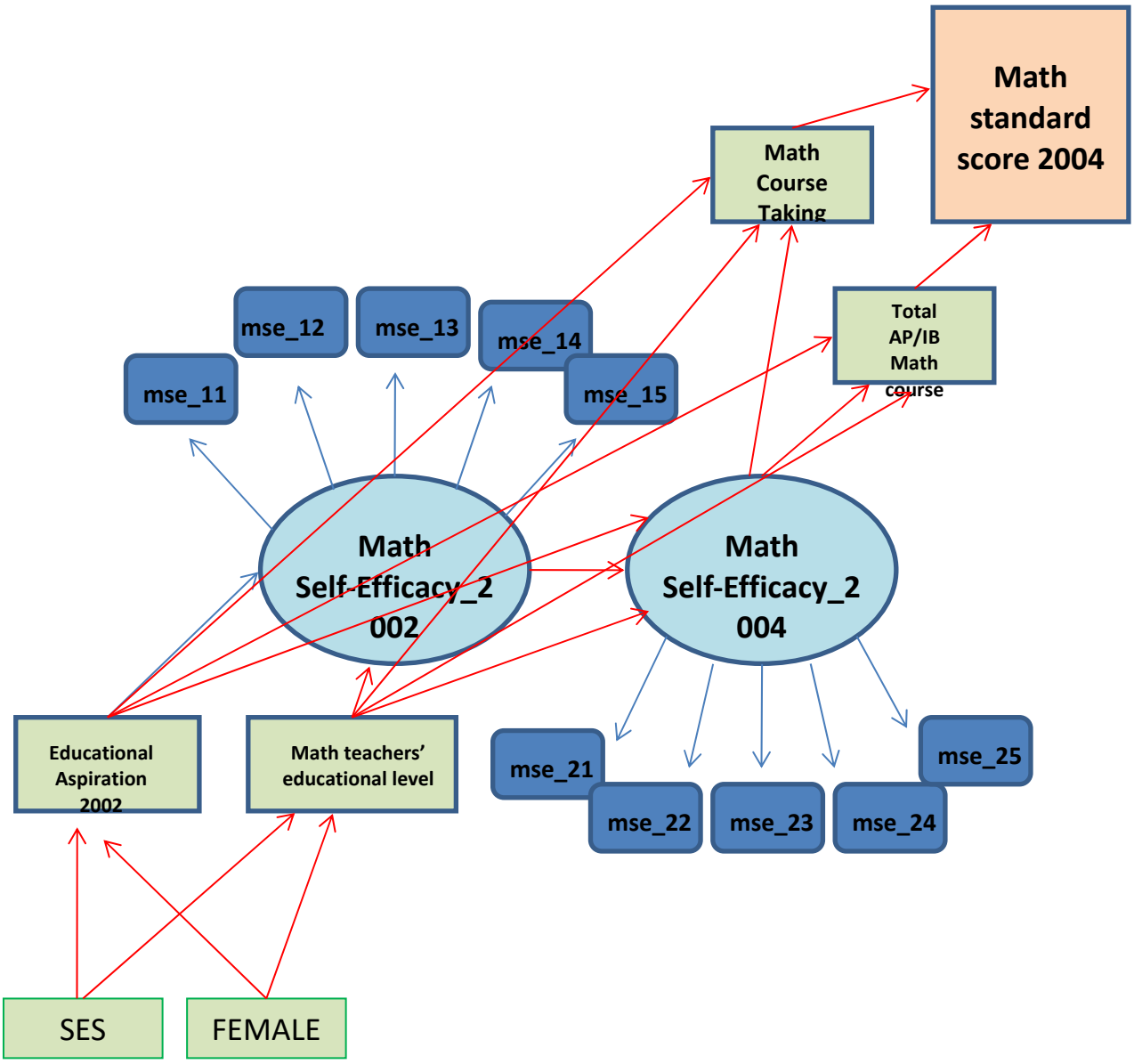
To address these issues, this study will respond to the following research questions: a) What are the learning factors affecting math achievement? b) To what extent is gender associated with the learning factors? The national profile provides recommendations to educators, policy makers, parents, and female students themselves regarding how learning environments and processes can improve the math achievement of female students, which causes more female students to choose STEM majors in college.

CONCEPTUAL FRAMEWORK

The hypotheses of this study are (a) math self-efficacy will affect the math achievement of female students; (b) a variety of academic and psychosocial factors such as the degree of taking advanced math courses and the educational aspiration of getting advanced educational degrees will influence the math self-efficacy of female students; and (c) students' background factors (i.e., gender, social economic status (SES)) are associated with the academic and psychosocial factors. These hypotheses are established based on the social cognitive career theory (SCCT). SCCT (Lent, Brown, and Hackett, 1994) indicates that personal input (e.g., gender, racial/ethnicity background, disability status, etc) and environmental factors (e.g., social economic status, teacher support, etc) are associated with learning processes, impacting on learners' self-efficacy, academic performance, and career

choices or goals. Through structural equation modeling (SEM), this study will examine how well SCCT fits into the proposed model (Figure 1).

Figure 1. Math Achievement Model of Female Students



METHOD

In the dataset of the Educational Longitudinal Study of 2002 (ELS 2002/06), a sample of 8,147 female and 8,050 male students who were in 10th grade in 2002 was collected to examine gender differences in academic and psychosocial factors affecting math achievement. The gender and SES of a student are the exogenous variables in the proposed model (See Figure 1). A variety of academic and psychosocial factors are regarded as mediator variables. As shown in Figure 1, educational aspiration in attaining educational degrees, the degree of taking advanced math courses, total number of AP/IB math courses, and educational levels of math teachers are associated with math self-efficacy level, which has an effect on the math achievement level. Math self-efficacy is a latent variable that has been constructed by explanatory factor analysis (EFA) and confirmatory factor analysis (CFA). The observed variables that explain the math self-efficacy latent variable were collected in 2002 and 2004, and thus, in this proposed model, there are two sequential math self-efficacy latent variables (i.e., math self-efficacy in 2002 and 2004). The outcome variable is a math standard score accessed in 2004. SEM is an appropriate statistical method because (a) this study examines relationships among academic and psychosocial factors which have an effect on math achievement; (b) this study tests whether the SCCT fits into the proposed model; and (c) the proposed model includes latent variables (i.e., math self-efficacy).

RESULTS

Based on the goodness of fit (i.e., CFI = 0.95, RMSEA = 0.065, SRMR=0.031) of the proposed model, SEM reveals that (a) academic factors (i.e., educational aspiration in attaining educational degrees, the degree of taking advanced math courses, total number of AP/IB math courses, and educational levels of math teachers) have a significant direct effect on math achievement level, regardless of gender (p<. 001); (b) two sequential math self-efficacy latent variables are positively associated with math achievement (p<.001); (c) there are positive relationships among the academic factors and the math self-efficacy in 2002 (p<.001); (d) compared to male students, female students have significantly lower self-efficacy levels in both years, 2002 and 2004 (p<.001), which is most likely to affect lower math achievement (p<.001); (e) compared to male students, female students are more likely taking advanced math courses and aspiring to attain higher educational degrees (p<.001). Table 1 shows the detailed model results including standard errors and factor loadings of the variables. The Table 2 represents the total and indirect effects for the math achievement.

Table 1. Maximum Likelihood Robust Estimates Direct Effects of Math Achievement Model

	Estimate	S.E.	Est./SE	Std	StdYX
MEASUREMENT MODEL					
MSEFFI_1[1] BY					
MSE_11[2]	1.000	0.000	0.000	0.751	0.810
MSE_12[3]	1.022**	0.007	146.674	0.767	0.817
MSE_13[4]	1.102**	0.009	129.192	0.827	0.857
MSE_14[5]	1.077**	0.008	127.238	0.808	0.857
MSE_15[6]	1.075**	0.009	121.681	0.807	0.853
MSEFFI_2[7] BY					
MSE_21[8]	1.000	0.000	0.000	0.722	0.804
MSE_22[9]	1.022**	0.009	117.570	0.738	0.820
MSE_23[10]	1.045**	0.009	115.003	0.754	0.815
MSE_24[11]	0.942**	0.008	119.626	0.680	0.774
MSE_25[12]	1.041**	0.008	122.660	0.752	0.808
STRUCTUAL MODEL					
MSEFFI_2 ON					
MSEFFI_1	0.462**	0.008	55.618	0.480	0.480
MSEFFI_1 ON					
FEMALE	-0.211**	0.012	-17.493	-0.281	-0.141
SES	0.044**	0.005	8.079	0.058	0.066
Math Teacher Educational Level	0.012*	0.006	2.010	0.015	0.016
Educational	0.128**	0.004	29.342	0.171	0.246

1 Math Self-Efficacy in 2002

2 Can do excellent job on math tests

3 Can understand difficult math texts

4 Can understand difficult math classes

5 Can do excellent job on math assignment

6 Can master math class skills

7 Math Self-Efficacy in 2004 follow-up

8 Can do excellent job on math tests

9 Can understand difficult math texts

10 Can understand difficult math classes

11 Can do excellent job on math assignment

12 Can master math class skills

Aspiration					
MSEFFI_2 ON					
Female	-0.058**	0.011	-5.318	-0.080	-0.040
SES	0.013*	0.005	2.757	0.019	0.021
Math Teacher Educational Level	0.007	0.005	1.269	0.009	0.009
Educational Aspiration	0.022**	0.004	5.448	0.030	0.044
Math Standard Score ON					
MSEFFI_2	2.463**	0.096	25.617	1.778	0.192
MSEFFI_1	0.370**	0.093	3.977	0.277	0.030
Math Course Taking Pipeline ON					
MSEFFI_2	0.186**	0.020	9.523	0.134	0.082
MSEFFI_1	0.389**	0.019	20.431	0.292	0.178
Total AP/IB Math Courses ON					
MSEFFI_2	0.034**	0.005	6.387	0.025	0.063
MSEFFI_1	0.084**	0.005	16.068	0.063	0.162
Math Standard Score ON					
Math Course Taking Pipeline	2.366**	0.046	51.362	2.366	0.420
Total AP/IB Math Courses	3.591**	0.148	24.260	3.591	0.151
Math Teacher Educational Level	0.183*	0.053	3.428	0.183	0.020
Educational Aspiration	0.315**	0.045	6.942	0.315	0.049
SES	1.422**	0.052	27.395	1.422	0.175
Female	-1.292**	0.110	-11.767	-1.292	-0.070
Math Course Taking Pipeline ON					
Educational Aspiration	0.349**	0.009	40.872	0.349	0.306
Female	0.117**	0.022	5.266	0.117	0.036
SES	0.339**	0.010	33.180	0.339	0.235
Math Teacher Educational Level	0.063**	0.011	5.845	0.063	0.039
Total AP/IB Math Courses ON					
Educational Aspiration	0.031**	0.002	16.260	0.031	0.115
Female	0.000	0.006	-0.055	0.000	0.000
SES	0.044	0.003	16.109	0.044	0.127
Math Teacher Educational Level	0.019	0.003	6.509	0.019	0.049
Educational					

Aspiration ON					
Female	0.404	0.021	18.926	0.404	0.141
SES	0.369	0.009	39.068	0.369	0.292
Math Teacher Educational Level ON					
Female	-0.006	0.016	-0.375	-0.006	-0.003
SES	0.053**	0.007	7.464	0.053	0.059
Selected goodness-of-fit indices					
X^2 (df=92) = 6463.713, p<.000; CFI = 0.950; TLI =0.926; RMSEA = 0.065; SRMR = 0.031					

Table 2. Standardized Total and Indirect Effects for the Math Achievement Model

	Estimate	S.E.	Est./S.E.	Std	StdYX
Effects from MSEFFI_2 to Math standard score					
Total	3.026**	0.114	26.627	0.236	0.236
Total indirect	0.562**	0.058	9.655	0.044	0.044
Specific indirect					
Math standard score					
Math course taking pipeline					
MSEFFI_2	0.440**	0.047	9.393	0.034	0.034
Math standard score					
Total AP/IB Math Courses					
MSEFFI_2	0.123**	0.020	6.240	0.010	0.010
Direct					
Math standard score					
MSEFFI_2	2.463**	0.096	25.617	0.192	0.192
Effects from Math teacher educational level to MSEFFI_2					
Total	0.012*	0.006	2.079	0.017	0.017
Total indirect	0.005*	0.003	2.009	0.008	0.008
Specific indirect					
MSEFFI_2					
MSEFFI_1					
Math Teacher Educational Level	0.005*	0.003	2.009	0.008	0.008
Direct					
MSEFFI_2					
Math Teacher Educational Level	0.007	0.005	1.269	0.009	0.009
Effects from SES to MSEFFI_1					
Total	0.092**	0.005	17.244	0.122	0.139
Total indirect	0.048**	0.002	23.831	0.064	0.073
Specific indirect					
MSEFFI_1					
Educational aspiration					
SES	0.047**	0.002	23.775	0.063	0.072
MSEFFI_1					
Math Teacher Educational Level					
SES	0.001	0.000	1.935	0.001	0.001
Direct					
MSEFFI_1					
SES	0.044**	0.005	8.079	0.058	0.066
Effects from Female to MSEFFI_1					
Total	-0.159**	0.012	-13.017	-0.212	-0.106
Total Indirect	0.052	0.003	15.709	0.069	0.035

DISCUSSION AND CONCLUSION

The results show that, for female students, among the antecedent learning factors, math self-efficacy has most significant effect on the math standard score. Interestingly, although female students have better math educational preparation in terms of taking advanced math courses and have higher educational aspiration than male students, they have lower math achievement than male students. Importantly, unlike the other learning factors, female students have significantly lower math self-efficacy than male students. It is most likely that the major learning factor impacting on lower math achievement of female students is the math self-efficacy of the female students. In fact, regardless of gender, SES, GPA, taking advanced math courses and higher educational aspiration significantly impact on math standard scores. These findings suggest that how to increase math self-efficacy is a critical matter for female students to improve math standard scores.

Considering the importance of math self-efficacy for female students, teachers, counselors, and parents should be aware of how educational environments and learning processes can increase the math self-efficacy of female students. Future studies should investigate the sources of math self-efficacy, gender differences in the sources, and the extent to which the sources impact on math self-efficacy and math achievement levels, conceptually framing the hypothesized sources of self-efficacy (i.e., experienced mastery, vicarious experience, verbal and social persuasions, and emotional and physical states) by Bandura (1986, 1997).

REFERENCES

Astin, A., & Astin, H. (1992). *Undergraduate science education: the impact of different college environments on the educational pipeline in the science.* Los Angeles: University of California, Los Angeles, Higher Education Research Institute.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Besterfield-Sacre, M., Atman, C., & Shuman, L. (1997). Characteristics of freshman engineering students: models for determining student attritions in engineering. *Journal of Engineering Education. 86*(2). 139-149.

Betz, N. E., & Hackett, G. (1983). The relationship of mathematics self-efficacy expectations to the selection of science-based college majors. Journal of Vocational Behavior, 23, 329–345.

Brown, S. D., & Lent, R. W. (2006). Preparing adolescents to make career decisions: A social cognitive perspective. In F. Pajares & T. Urdan (Eds.), *Adolescence and education*: *Self-efficacy beliefs of adolescents* (pp. 201-223). Greenwich, CT: Information Age.

French, B., J. Immekus, W., Oakes, W. (2005). Research brief: An examination of indicators of engineering students' success and persistence. *Journal of Engineering Education. 94*(4). 419-425.

Hackett, G., & Betz, N. E. (1981). A self-efficacy approach to the career development of women. *Journal of Vocational Behavior,* 18, 326–339.

Hackett, G., & Betz, N. E. (1983). The relationship of mathematics self-efficacy expectations to the selection of science-based college majors. *Journal of Vocational Behavior. 23*(3). 329-345.

Hackett, G., & Campbell, N. K. (1987). Task self-efficacy and task interest as a function of performance on a gender-neutral task. *Journal of Vocational Behavior, 30*, 203-215.

Hyde, J. S., Fennema, E., & Ryan, M. (1990). Gender comparisons of mathematics attitudes and affect: A meta-analysis. *Psychology of Women Quarterly. 14.* 299-324.

Lent, R.W., Brown, S.D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior. 45*. 79-122.

Lent, R.W., Lopez, F.G., & Bieschke, K.J. (1991). Mathematics self-efficacy: Sources and relation to science-based career choice. *Journal of Counseling Psychology*. 38(4). 424-430.

Levin, J., and Wyckoff, J. (1988). Effective advising: Identifying students most likely to persist and succeed in engineering. *Engineering Education. 78*(11). 178-182.

National Science Foundation. (2007). *Employed females 16 years and older, by detailed occupation: selected years, 1983-2007 annual averages.* Retrieved from http://www.nsf.gov/statistics/wmpd/pdf/tabh-2.pdf

Nicholls, G., H. Wolfe, M., Besterfield-Sacre, L., Shuman, S. Larpkiattaworn. (2007). A method for identifying variables for predicting STEM enrollment. *Journal of Engineering Education. 96*(1). 33-44.

O'Brien, V., Martinez-Pons, M., & Kopala, M. (1999). Mathematics Self-Efficacy, Ethnic Identity, Gender, and Career Interests Related to Mathematics and Science. *Journal of Educational Research, 92*(4), 231-235.

Pajares, F., & Urdan, T. (Eds.). (2006). *Adolescence and education: Vol. 5. Self-efficacy beliefs of adolescents.* Greenwich, CT: Information Age.

U.S. Census of Bureau. *The 2010 statistical abstract: bachelor's degree earned by field.* Retrieved from http://www.census.gov/compendia/statab/cats/education/higher_education_degrees.html

U.S. Department of Labor. (2007, April). *The STEM workforce challenge: the role of the public workforce system in a national solution for a competitive science, technology, engineering, and mathematics (STEM) workforce.* Retrieved from http://www.doleta.gov/Youth_services/pdf/STEM_Report_4%2007.pdf

Veenstra, C.P., Dey, E.L., & Herrin, G.D. (2008). Is modeling of freshman engineering success different from modeling of non-engineering success? *Journal of Engineering education.* 469-479.

THINKING ABOUT TEACHING: DOES A STUDENT TEACHER IMPACT THE REFLECTIVE PRACTICES OF A COOPERATING TEACHER?

Vincent T. Laverick
The University of Findlay & Bowling Green State University
vlaverick12@gmail.com

ABSTRACT
With the current movement toward evaluation of teachers based on student growth measures, this qualitative study was conducted to learn if the presence of a student teacher in the classroom of an in-service teacher improved the reflective practices of the in-service teacher. Rodgers' (2002) definition of reflection was used as the theoretical framework for the study. Five teachers participated in a pre- and post-survey. In addition, four of the five teachers who participated in the surveys also participated in an interview. The results of the study were inconclusive. All of the in-service teachers felt the presence of the student teacher made them more reflective; however, the data did not indicate a change in the reflective practices of the teachers due to the presence of the student teacher.
Keywords: Reflection, teacher improvement, teacher evaluation

INTRODUCTION

The K-12 educational world has made the shift to evaluations of teachers based on student growth in the classroom. The National Council on Teacher Quality (2016) found over forty of the United States' educational programs currently have some variation of student growth incorporated into teacher evaluations. Like most of the nation, Ohio has implemented the Ohio Teacher Evaluation System (OTES) to measure teacher effectiveness using student growth as a large portion of the teacher evaluation. Ultimately, the OTES guarantees teachers will be evaluated, in some part, based on the performance of their students' performance on future assessments. Teachers are now more aware of student performance on these assessments as their personal teacher evaluation will reflect the student growth on the assessments. Under the premise of a reflective teacher is a more effective educator (Dewey, 1910; Schon, 1983; Schon, 1987; Adler, 1990; Mezirow, 1990; Hargreaves & Shirley, 2012), a presumption can be made that OTES should cause teachers to examine methods to improve their teaching ability and practices. With the presumed impact on teacher desired improvement due to OTES, the opportunity preservice teachers provide, and the benefits of reflection in mind, this study examined the impact a student teacher has on the reflective practices of a cooperating teacher.

Rationale & Significance of the Study

Upon the researcher's discussions with the five cooperating teachers who were not likely to accept another student teacher due to the implementation of OTES and their concern for a student teacher negatively impacting their evaluations, the researcher began to be concerned pre-service teachers would not receive the appropriate opportunity to work within a classroom. Hertzog and O'Rode (2011) pointed out, "The student teacher experience has been identified as one of the most influential factors in preparing beginning teachers" (p. 90). Without current teachers working with student teachers, the student teachers will have limited opportunities for individual growth as they prepare to enter the field as professionals after graduation. With the expected growth and measurable effectiveness of educators due to OTES, there seemed to be an opportunity for student teachers to impact the reflective practices of practicing teachers. In addition, the premise of a reflective teacher is a more effective educator (Dewey, 1910; Schon, 1983; Schon, 1987; Adler, 1990; Mezirow, 1990; Hargreaves & Shirley, 2012) provided a great opportunity to examine if the student teacher impacts the reflective practices of a cooperating teacher.

LITERATURE REVIEW

Reflection

As the study focused on reflection, it is necessary to understand how reflection has changed and impacted current practices. Reflection became an integral aspect of education with *How We Think* (1910). In the text, Dewey defined reflective thought as "Active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it, and the further conclusions to which it tends" (1910, p. 6). In addition, he delineated two required elements for reflective thinking to occur: 1. The existence of a problem or issue at hand and 2. The search, investigation, or evaluation to understand the facts to support or nullify the belief at hand (Dewey, 1910). Over the years, Dewey's foundation was misapplied or practiced incorrectly (Kompf & Bond, 1995). Thus confusion for educators and theorists existed on how to apply Dewey's theories. Schon (1983, 1987) moved reflection forward as she delineated methods professionals can

use their implicit knowledge and learn from experiences. In addition, Shon delineated two types of differing reflection: reflection-on-action and reflection-in-action (Schon, 1983; Finley, 2008).

In Schon's (1987) reflection-on-action, the individual comes across a situation or unexpected outcome happened in the past and the individual is revisiting it in the present and the reflection has no bearing or direct connection to present actions. Reflection-in-action occurs in the present or a time close to present where the reflection is able to affect the situation at hand. The thinking and reflecting affects what the individual is doing at a time when he/she is able to make a difference in the outcome (Schon, 1987).

Building upon Schon's ideas, Zeichner and Liston (1996) created five levels of reflection that directly relate to the teaching profession. The five steps are sequential and build upon the previous step. Rapid reflection is first which required instantaneous and automatic action by the instructor. Second is repair where a teacher makes adjustments and decisions in response to cues from the students. Review is third as it allowed the educator to think, discuss, or write about an occurrence. Research is next where a teacher collected data or analyzed research to allow for systematic and sustain thinking. Finally, retheorizing and reformulating occurred when a teacher critically examines his or her own theories and practice in regard to academic theories (Zeichner & Liston, 1996).

A common issue with the success of reflective practice and thinking is the ability to remove personal bias in the process (Mezirow, 1990). Rodgers (2002) enters the literature addressing this common problem when she required reflection to be done in community of others and following scientific inquiry. With the addition of a community member in the process, it is easier to lessen the individual bias. Ultimately, a learning community and collaboration allowed others to help in the critical analysis of an individual's behavior (Osterman & Kottkamp, 1993; Van den Bossche & Beausaert, 2011).

Collier (1999) found in her study with student teachers, the importance of the individual in the process. The individual's constantly changing world view and beliefs on teaching and learning will directly effect the level at which the individual will be able to reflect. In addition, learners who view educators that place an emphasis on reflecting are more likely to begin attempting the reflective process themselves (Kaye, 2014). With a cooperating teacher attempting to model the best practices of the profession for the student teacher, it was interesting to evaluate if the student teacher had an impact on the reflective practices of the cooperating teacher.

METHODOLOGY

Theoretical Framework

In order to understand the effect a student teacher has on the reflective practices of a cooperating teacher and the number of reflective opportunities, a decision was made by the researcher to utilize Carol Rodgers' (2002) definition of reflection as a theoretical framework for the study. She delineated the criteria of reflection into four distinct areas:

> 1. Reflection is a meaning-making process that moves a learner from one experience into the next with deeper understanding of its relationships with and connections to other experiences and ideas. It is the thread that makes continuity of learning possible, and ensures the progress of the individual and, ultimately, society. It is a means to essentially moral ends.
> 2. Reflection is a systematic, rigorous, disciplined way of thinking, with its roots in scientific inquiry.
> 3. Reflection needs to happen in community, in interaction with others.
> 4. Reflection requires attitudes that value the personal and intellectual growth of oneself and of others. (p. 845)

In addition, the above definition was not only the theoretical foundational for this article but also the framework from which the collected qualitative data was coded.

Research Question

The theoretical framework for reflection as explained by Rodgers above was the basis for analyzing the results. As a key aspect of the study was the reflective practices and changes by the cooperating teacher, the following question was developed:

1. Does a student teacher cause a cooperating teacher to change his/her reflective practice?

Beyond the immediate answer to the question, the researcher attempted to ascertain how, if at all, the student teacher caused the cooperating teacher to be more reflective.

Research Design

The study was developed as a qualitative design to analyze the reflective practices of cooperating teachers and how the presence of a student teacher affects these reflective practices. Again, the theoretical foundation utilized is Rodgers' (2002) definition of reflection. Grounded Theory (Corbin & Strauss, 1990) was utilized to deduce meaning from the surveys and interviews.

Participants

Subjects had a student teacher in their classrooms from a small, private institution from Northwest Ohio for the spring 2015 semester. The subjects were part of a convenience sample as their proximity (a radius of 40 miles) allowed the researcher to interview them easily in a short time period of a couple weeks due to the student teacher leaving the placement and the end of school. Subjects were then further restricted based on teaching grades 6-12. Thirty teachers met the criteria for inclusion in the study. Of the thirty contacted teachers, five completed the survey and four cooperating teachers agreed to participate in the interview process after the surveys. It is important to note the four cooperating teachers who participated in the interview were part of the same group of individuals who completed both the pre and post surveys through Google Drive.

As the survey participants were not asked to complete or provide any identifiable information, the participants of the survey will be reported in one large group. Data were analyzed for tendencies over the large group. Within the group, one teacher has been teaching 1-5 years, one 6-10 years, two 11-15 years, and one 25 or more years. Four of the five teachers self-reported as working in rural school districts. The fifth teacher reported working in a suburban school district. Two of the cooperating teachers were employed in middle schools while the other three reported working in a high school setting. The teaching experience in terms of years of the five teachers involved in the survey varies as well. Lastly, one teacher self-reported having earned an undergraduate degree, three teachers earned a master's degree, and one has earned a master's degree plus additional graduate credits.

As the interview of the participants allowed for a more detailed description of the participants, each participating teaching was assigned a letter and he/she will be referred to as Teacher A, Teacher B, Teacher C, or Teacher D. Teacher A was a male history teacher of 11 years employed at a rural high school. Teacher B was a male history teacher of 6 years in a rural middle school setting. Teacher C was a male history teacher of 16 years in a split middle school and high school rural setting. Lastly, Teacher D was a female science teacher of 4 years in a rural middle school setting.

Data Collection Procedures

Participants were emailed the survey through Google Survey to their professional email address. Google Survey compiled the responses in a spreadsheet based on each individual question and response as each participant completed the survey. The survey contained both multiple choice as well as extended responses. The final survey in May was completed in the same format as the initial December survey. In addition, the May survey was identical to the December survey.

The interview was arranged at the participant's school at a time convenient for the participant. The interview was conducted in a semi-structured interview process to allow for follow-up questions to be asked and ideas further explain by the participants (Drever, 1995; Fraenkel, Wallen, & Hyun, 2014). The interview was taped and recorded. The interviews lasted approximately 20 minutes. Upon completion of the interview, the responses of the participants were transcribed by the researcher.

RESULTS

Interviews

Teacher A

To begin the examination of Teacher A, it was best to review Teacher A's personal reflection practices in order to establish a beginning point prior to the student teacher's arrival and then compare it to the self-explained practices when the student teacher was present. Teacher A, when asked about his personal reflection practices prior to the student teacher, focused on meaning making. For example Teacher A stated, "Mine is just looking at the overall understanding. Did the students get what we were trying to get across? What are the questions that [the students] asked? What are areas that they need help in? And basically, just what can you do better?" Here, he was making meaning of the feedback provided by the students and comparing it to his theory of education to create an understanding of what the students need as far as extra support. This connected to Rodgers' framework as Teacher A was making meaning of the feedback and connected it to his personal theory of education.

When Teacher A was asked to explain how his reflection opportunities changed as a result of the student teacher, he elicited a response signifying community. Teacher A stated, "…just to get an open conversation going." This shows an attempt to build a situation where a community can exist. Teacher A attempted to ask open ended questions in an effort to truly understand his student teacher's ideas.

Along with community, Teacher A indicated a response relating to scientific inquiry. He stated, "…just kind of thinking as I would have done this as a teacher. What would the results have been? Versus what he did. What were the results? Pros/ cons. Look at it both ways." Here Teacher A was interpreting his teaching experience against those of his student teacher, naming questions that arise, generating possible explanations, and trying to generate explanations. By conducting this analysis, he was using the scientific inquiry process:

spontaneous interpretation of the experience, naming the problems or questions from that experience, generating explanations, and developing a hypothesis.

Also, Teacher A indicated an increase in his desire for a growth of self and others with the student teacher present. Teacher A commented, "Yeah, you, if you're not growing professionally I think you are kind of missing out on the boat of the whole experience. This is the third [student teacher] I have had in my career and every one has brought just a little bit of different picture to the overall teaching." Again, Teacher A is indicating a willing and open approach to learning about his practice with his student teacher. He mentions how each student teacher brought a "different overall picture" to his teaching.

Lastly, Teacher A indicated he felt the student teacher makes him more reflective. To explain, Teacher A felt he was afforded more time when working with a student teacher. He stated, "...there is a little bit more time and you are always trying to think of what they can do better to try and help them." This indicated an improvement focus on the student teacher, but he continued by stating, "…this way it opens up your schedule a little more while you are in school you are able to think more on school related topics." Also, Teacher A concluded, "And just a normal teaching mode where you are by yourself and there is no student teacher, you are just going from class to class to class and at the end of the day you're not always thinking about what you did that day." Indeed, Teacher A strongly indicated how the additional time allowed him to believe he was more reflective when working with a student teacher.

Overall, Teacher A indicated a presence of meaning making in his pre student teacher reflection situations. Once the student teacher arrived, comments indicated a presence of scientific inquiry, community, and growth of self and others. In addition, Teacher A indicated that having a student teacher caused him to be more reflective.

Teacher B

As with Teacher A, an analysis of Teacher B's personal reflection practices was used to establish a beginning point prior to the student teacher's arrival and then compare it to the self-explained practices when the student teacher was present. Teacher B initially focused on scientific inquiry. Teacher B stated, "I like, I definitely reflect on, I think the, the lesson delivery to find out if it was successful. When I look at kids' results when I formative assess them, what did I do well and what can I improve. What holes are there in my, is in my delivery. And what holes is in their content knowledge. And how I can fix it for the following day." Clearly, this comment reaches three of the elements of scientific inquiry as Teacher B made a spontaneous interpretation of the results from a formative assessment: "…what did I do well and what can I improve." Based on these results, he analyzed any possible "holes" in his delivery and student content knowledge. He then finished with a search for possible explanations. All of these steps indicated scientific inquiry.

Teacher B with the student teacher indicated a response in the meaning making area. Teacher B stated, "I have had the luxury of having a student teacher to be able to really reflect on everything that I have been doing, and almost forcing them to try something new." By "reflecting on everything I have been doing," he was making meaning on his previous moments and evaluating these experiences against his operating theory of education.

Lastly, Teacher B was asked if he felt he was more reflective with the student teacher. Teacher B indicated he felt the student teacher makes him more reflective. In addition, Teacher B indicated a reason for his answer that focused on growth of self and others and meaning making. Teacher B stated, "…because I need to be able to practice what I preach. It is very easy to sit in this chair when someone else is in front for the class and be critical. ... If I am going to enforce a standard or preach some sort of educational philosophy, I better be practicing it when that student teacher leaves." Now, Teacher B indicated a growth of self and others as he has stated an awareness of understanding what needed to be changed and an effort to "practice what he preaches."

Overall, Teacher B indicated a presence of scientific inquiry in his pre student teacher reflection situations. Once the student teacher arrived, comments indicated a presence of meaning making and growth of self and others. In addition, Teacher B indicated that having a student teacher caused him to be more reflective.

Teacher C

As with the previous two teachers, Teacher C's personal reflection practices were used to establish a beginning point prior to the student teacher's arrival and then compare it to the self-explained practices when the student teacher was present. Teacher C focused on meaning making for his reflective practices prior to the student teacher. Teacher C stated, "One of the things that I do like to make sure that works is if I do something in class and it gives the kids too much free time and they are screwing around then I immediately, I don't reflect upon it necessarily, I immediately say on the fly once again, I immediately say, 'This isn't working I need to do something else.' Or I need to stretch it out." This demonstrated Teacher C's desire to make meaning of his experiences. Teacher C attempted to draw a connection between his experiences and use them to build his theory on educating students. His pedagogy was used in an "immediate" sense as he made decisions and adjustments within the class period.

Once the student teacher arrived, Teacher C's focus continued to be meaning making. Teacher C stated, "I was just saying, 'Here is what I do, and here is what you did. And here's why I do it my way. And

here's why doing it your way doesn't work because you saw the results.'" Again, Teacher C compared the student teacher's practices to his own for a meaning making purpose. Clearly, he used his observations to inform his practices and compared his practices to those of his student teacher.

In addition, Teacher C indicated a response relating to community. He stated, "So, I guess, discussion." Here, Teacher C indicated for the first time a collaborative effort between his student teacher and himself. As a discussion indicated a two person moment where both were contributing, it was established this comment fit into the community aspect of reflection.

When asked if the student teacher impacted his reflective practices, Teacher C indicated a strong "no" in regard to the initial question. He did not feel the presence of a student teacher led to a change in his practice. However, Teacher C continued his expressed comments on meaning making with the presence of a student teacher. Teacher C explained vaguely about how the presence of a student teacher allowed him to form meaning about his own teaching practices. Teacher C stated, "I guess I might have, you know, I sat and listened to him and been like, 'OK, maybe I have fallen into this trap a little bit.'" In addition, Teacher C commented, "But every once in a while something he would do would kind of get my attention and I would think, 'OK, well, you know, maybe I'm telling him not to do that but here maybe I'm doing it.' So maybe I could not do that anymore." Although not providing specific examples, Teacher C explained how the presence of the student teacher provided an opportunity for him to analyze the meaning making aspect.

Overall, Teacher C indicated a presence of meaning making in his pre student teacher reflection situations. Once the student teacher arrived, comments still indicated a presence of meaning making and one reference to community. In addition, Teacher C indicated that having a student teacher did not cause him to be more reflective although he was unable to provide a clear reason to support his belief.

Teacher D

An analysis of Teacher D's personal reflection practices was used to establish a beginning point prior to the student teacher's arrival and then compare it to the self-explained practices when the student teacher was present. Teacher D focused completely on scientific inquiry when asked about her reflective practices. Teacher D stated, "I'll look at the growth that I have seen from my kids from the beginning to the end with those formative assessments. How I thought the flow of the lesson went. If I needed to change up the order of anything or if I needed to add in any extra explanations." Here, Teacher D indicated an interpretation of formative data from assessments. She used this data to name any problems she observed and attempted to generate possible explanations.

With the inclusion of a student teacher, Teacher D focused on community and meaning making. To explain the community aspect Teacher D stated, "I am a super reflective person so I think if anything though it was just nice to have another person to bounce the reflections off. So, that was one nice thing. I am the only sixth grade science teacher so I talk with my other colleagues about you know how things are going in class. We meet every day in team but it was nice having somebody in my classroom that we could kind of talk together." Teacher D explained how the presence of a student teacher provided the in-class reflective piece she felt she does not have in her school as the only science teacher in her grade. Her explanations displayed the personal benefit she experienced from an additional person in the classroom upon her reflective practice.

Along with comments on meaning making and community, Teacher D commented in regard to growth of self, "…having someone come into your classroom makes you more aware of what you are doing and so it makes you strive to make sure that everything is even more perfect than before." Her desire to do activities and her practices more shows her concern for her own teaching pedagogy as well as that of her student teacher.

In addition, Teacher D indicated she felt the student teacher made her more reflective. However, she did not provide a clear response for why she felt this way in regard to being more reflective. In addition, none of her comments fit within any of the reflective areas for the codes used in this study.

Overall, Teacher D indicated a presence scientific inquiry in her pre student teacher reflection situations. Once the student teacher arrived, comments did not indicate anymore areas of scientific inquiry but rather moved toward meaning making, community, and growth of self and others. Teacher D indicated that having a student teacher caused her to be more reflective although she was unable to provide a clear reason to support her belief.

SURVEYS

As there were two surveys administered to the participating cooperating teachers, it is important to begin with an examination of the survey prior to the presence of the student teacher and compare its comments to those of the survey after the student teacher was finished in the placement. The initial survey had five respondents. When asked the question, *What is the content of a typical reflective period you have on a typical school day?*, the only area related to reflection was meaning making.

As the respondents were not identifiable, all comments will be talked of in general. Of the five respondents, only four made comments in the meaning making area. Typical comments included, "Teaching strategies, questioning, assessment, homework assigned, how did students respond to lesson, what questions did they have

following lesson." Here, the teacher was examining specific moments in the day and comparing them to his/her theory. Looking at student responses that fit and those that did not fit in to the working theory were reflected upon by the teacher. Another teacher stated, "Student responses, flow of lessons, availability & ease of use with technology, student HW, testing results." This depicted a teacher examining a multiple of items from the classroom: responses, lessons, technology, homework, and testing results. The teacher is making meaning of these experiences as they either fit or do not fit into his/her working theory.

After the presence of a student teacher, the four of the five cooperating teachers' comments were focused on meaning making. The cooperating teachers commented, "I think about what went well, what can I do better, & what questions were asked that I need to address in the future." Here, this teacher was reviewing his/her success or failure within the classroom and comparing it to his/her operational theory for education. In addition a teacher stated, "What went well an[d] what totally bombed. How does this relate to decisions I've made in the past? What is this connected to that I can use in the future?" Again as with the previous teacher, this educator was comparing what happened to his/her working theory. The statement concerning an effort to make connections and an evaluation on how to use the understanding in the future directly relates to meaning making.

All of the comments depict examples of cooperating teachers who had an experience and are attempting to make meaning of the situation that occurred in order to connect to their operating theory of education or to challenge it for further consideration. Each one was looking to improve his/her practice by examining a practice and evaluate its usefulness.

DISCUSSION

Does a student teacher cause a cooperating teacher to change his/her reflective practice?

In reviewing of the data, it was clear the teachers indicated more of the elements of reflection. However, no single teacher displayed all four elements of reflection through their responses at any point in the interview when analyzed as before and after the presence of the student teacher. This finding was unanticipated as the researcher felt the only missing link for the four pillars of reflection to occur was community. It was assumed the teachers were meaning making, conducting scientific inquiry, and had a desire for a growth of self and others as these are the required elements of reflection. Interestingly, each teacher indicated more of the pillars of reflection but none achieved all four in the presence of the student teacher. This indicated to the researcher the cooperating teachers were not familiar with the full reflective process.

By an addition of the survey information, the data did not indicate any change in reflection prior to the student teacher when compared with afterward. All the teachers commented on meaning making both before and after the presence of the student teacher. This was not surprising as teachers constantly have to make decisions and make meaning from their experiences. The meaning making element seemed to be the most basic element of teaching- solving problems as they happen.

After review of both the interviews and surveys, the result was inconclusive. The teachers all believed they were more reflective as indicated in their responses. However, the data did not support their claims. The surveys showed only meaning making with no reference of the other three elements of reflection. The interviews showed an increase of the reflective elements in the teachers when a student teacher was present. However, no teacher indicated a use of all four categories of reflection in their responses.

Upon reviewing the results, it is clear there are some direct connections to the established research on reflection. Dewey's (1910) assertion required two items for reflection to occur: a problem or issue and an investigation/evaluation to support or nullify the belief held. An unmentioned element is required when reflection is taking place: time. An individual is required to have time in order to properly investigate and evaluate a problem. Interestingly, Teacher A indicated the increase in time as a factor for the increase of reflection. Although not referenced by the other teachers in their responses to the survey and interview questions, it stood as an important reminder of the time element required to fully participate in the reflective process.

A continued reference to the time element occurred when a connection was attempted to be made with Zeichner and Liston's (1996) five steps for reflection when teaching. It was apparent many of the teachers were able to navigate through the first two levels: rapid reflection and making adjustments based on cues. Teacher C was the most eloquent teacher whom depicted these first two steps. He even commented, "It is something I do right on the fly." Here he depicted how he rapidly reflected and the adjustments based on his perceptions from the students and the environment. These "on the fly" adjustments indicated Teacher C had to make rapid reflection as he did not have much time to analyze the situation and consider all elements. In addition, Teacher C made adjustments based on the cues he gained from the students as he explained how he made choices within the flow of the typical classroom session.

The third element as explained by Zeichner and Liston (1996) is review where a teacher thinks about, discusses, or writes about some aspect of his/her teaching. The teacher is putting thoughts to the written word to examine the fairness of what he/she is producing, exhibiting, teaching, and demonstrating (Adler, 1990). Teacher D demonstrated review in her responses. She stated, "…I paid more closer [sic] attention to the details that I was

[writing] in my reflection." Teacher D repeatedly discussed how she would write on note cards or plans her reflections of the class period. This connects to Zeichner and Liston's (1996) final element as Teacher D actually wrote her thoughts down based on her experiences within the classroom.

The fourth and fifth items discussed by Zeichner and Liston (1996) were when a teacher engages in a systematic and sustained thinking over time typically by collecting data or analyzing research and finally when a teacher critically examines his or her own theories and practice in regard to academic theories. Neither was described in the surveys nor interviews. All the teachers in the interview indicated the increase of reflection. However, none described the systematic and sustained thinking or critical analysis of their own theories and practice. A possible reason for this lack of reaching the final two items could easily be the lack of time a teacher has in his/her day to effectively reflect without interruptions from students, teachers, parents, and administrators. In addition, there are the required elements of lesson planning and assigned duties such as lunch room, study hall, and hall duty. All of these elements require time that can be used for the purpose of reflection.

Another element connected between the existing literature and the results of this research question was the aspect of community. Community was shown to reduce personal bias (Mezirow, 1990) and to allow others to help the individual critically analyze his/her own behavior (Osterman & Kottkamp, 1993; Van den Bossche & Beausaert, 2011). Also, Rodgers (2002) included community as one of her four pillars of reflection. The presence of the student teacher in the classroom provided a perfect community aspect to appear. Teacher C actively described,

> I am a super reflective person so I think if anything though it was just nice to have another person to bounce the reflections off. So, that was one nice thing. I am the only sixth grade science teacher so I talk with my other colleagues about you know how things are going in class. We meet every day in team but it was nice having somebody in my classroom that we could kind of talk together.

In addition, Teacher D commented, "And so it was nice to have somebody to bounce ideas off of to see OK if we were going to change something, how would we change it?" Finally, Teacher D explained, "…I have a lot of questions that I feel like I have to answer myself that I don't get a lot of you know. So it is nice when you can go back and forth with somebody else." Teacher D explained how the presence of a student teacher provided the in-class reflective piece she felt she does not have in her school as the only science teacher in her grade. Clearly, the community aspect of another person to communicate with in order to help her teaching practices was a benefit for Teacher D.

The positive element for Teacher D based on the community aspect provided by the student teacher and the impact on her reflective practices seemed to be more beneficial based on the school situation. As Teacher D is the only science content area teacher for her grade level in her building, there seemed to be the added benefit for the presence of the student teacher as the individual provided a community possibility right within her classroom. This benefit should be seen in most classrooms with student teachers but seems to be more pronounced in this situation due to the limited community options Teacher D has in her school in her content area.

Although not mentioned by the other individuals specifically in the data collection, community is an area of interest for future exploration to see if this is a common phenomenon. Teachers are by nature exclusionary in their classrooms from their peers due to the significant amount of time needed to collaborate (Sanholtz & Merseth, 1992) unless they are in a team or co-teaching environment. The response indicated by Teacher D shows the reality for a teacher. The benefits seem to be obvious and it is curious whether a larger sample would have produced similar results.

The final aspect of reflection mention in regard to a student teacher and his/her impact of reflection was Johns' (2009) that just because an individual is able to understand the meaning of data does not mean he or she can easily change his/her practices. From the lack of ease in ability to change practices, Johns (2009) described three basic inhibitors to use of the reflective practice due to culture: tradition, force, and embodiment. Tradition is adhering on to predetermined customs, norms, and prejudices that existed prior to the reflection process. Force is the way normal relationships are maintained and created through force or power. Embodiment is the way people normally think about the world prior to the reflective process (Fay, 1987). Although not a clear and perfect connection, all four teachers in the interview indicated the student teacher did not cause them to try a new or untried method in their classroom. Many of the teachers said no but then further explained how they were going to borrow an idea the student teacher proposed in the classroom. For example, Teacher A indicated a Pythagorean's Theorem idea he would be using for future lessons.

Overall, it was curious how the teachers all felt they were more reflective when working with a student teacher in their presence. However, the data from the surveys and interviews show this was not demonstrated. This lack of an increase of reflection may be due to several factors. The teachers were not provided a clear working definition of Rodgers' (2002) theory being used as the foundation of the study. Also, the teachers demonstrated a lack of knowing the definition of reflection in both the survey and interview. However, this created a bit of a paradox. If the working theory was provided, would the teachers have responded differently and provided the researcher with what he wanted to hear rather than what was actually happening in the school?

Also, it is plausible the addition of the student teacher created a situation where the cooperating teacher was even busier with increased demands. This increase in the demand on time could easily impact the amount of time available for reflection causing the adverse effect- less reflection.

LIMITATIONS

There were two major limitations present in this study. First, the cooperating teacher participated with full knowledge of the focus of the study. With the focus in mind, each participant completed two surveys and participated in an interview. This may have led to the halo effect as participants possibly provided information that made them look more reflective or provided information that the researcher would want to hear. An effort was be made by the researcher to eliminate the halo effect by using a scripted survey and interview.

Along with the participant limitation, the study was limited on time. As student teachers only work with a cooperating teacher for the duration of their school semester, the influence of the student teacher on the reflective practices of the cooperating teachers is limited to around five months in duration. This study did not take into account the maturation threat (Fraenkel, Wallen, & Hyun, 1993). The reflective practices may still be developing and on-going after the student teacher leaves the placement. This study accessed the time immediately prior to the student teacher's arrival and immediately after the student teacher completed his/her placement.

Future Research Opportunities

After an examination of this research project, it was decided by the researcher there are several aspects of the study that could lead to future research opportunities. The most interesting one to the researcher was the idea of applying the same principle of the current study to a true co-teaching environment. Bacharach, Washut Heck, and Dahlberg (2010) described five differing methods to co-teach: one teach, one observe; one teach, one assist; station teaching; parallel teaching; supplemental teaching; alternative teaching; and team teaching. It would be interesting to evaluate if the co-teaching environment where both instructors, the student teacher and cooperating teacher, were actively involved in the educational process. It would be interesting to see if the differing dynamic of both teachers active in the classroom yields differing results in regard to the reflection occurring between the educators.

In addition to the co-teaching model, an analysis on the changing, or lack thereof, in practice of cooperating teachers due to the presence of a student teacher could be analyzed. Some of the teachers in this study indicated they changed or adapted their practices due to the student teacher's impact in the classroom while others indicated no change. It would be intriguing to evaluate the lack of change in regard to Johns' (2009) study that indicated a lack of reflection on practices due to tradition, force, or embodiment. A study analyzing which factor was most prevalent in the reluctance to reflect could prove valuable to the field of education.

Another area for further research would be a byproduct of the unintended consequence in regard to the participants not being able to define reflection and thus missing out on many of the benefits it provides. A study can be conducted where teachers are educated on the four elements of reflection and how to properly use each pillar. Upon the education of the teacher, an analysis can be conducted if there is an improvement in teaching practices. In addition, the same idea may be applied to a follow-up on this study. Education of both the student teacher and cooperating teacher on reflection and how to properly use it may very well provide interesting results and impact how we educate our preservice teachers and their cooperating teachers.

REFERENCES

Adler, S. A. (1990, Feb.). *The reflective practitioner and the curriculum of teacher education.* Paper presented at the meeting of Annual Meeting of the Association of Teacher Educators, Las Vegas, NV.

Bacharach, N., Washut Heck, T., & Dahlberg, K. (2010). Changing the face of student teaching through coteaching. *Action in Teacher Education, 32*(1), 3-14.

Collier, S.T. (1999). Characteristics of reflective thought during the student teaching experience. *Journal of Teacher Education 50*(3), 173-181.

Corbin, J.M. & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology 13*(1), 3-21.

Dewey, J. (1910). *How we think.* New York, NY: D.C. Heath & Co.

Drever, E. (1995). *Using semi-structured interviews in small-scale research. A teacher's guide.* Edinburgh. Scottish Council for Research in Education.

Fay, B. (1989). *Critical social science: Liberation and its limits.* Ithaca, NY: Cornell University Press.

Finley, L. (2008). Reflecting on 'reflective practice." *Practice-based Professional Learning Centre 52*, 1-27.

Fraenkel, J.R., Wallen, N.E., & Hyun, H.H. (2014). *How to design and evaluate research in education.* New York, NY: McGraw-Hill.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (1993). *How to design and evaluate research in education* (Vol. 7). New York: McGraw-Hill.

Hargreaves, A., & Shirley, D. (2012). *The global fourth way: The quest for educational excellence*. Thousand Oaks, CA: Corwin.

Hertzog, H.S. & O'Rode, N.O. (2011). Improving the quality of elementary mathematics student teaching: Using field support materials to develop reflective practice in student teachers. *Teacher Education Quarterly,38*(3), 89-111.

Johns, C. *Becoming a reflective practitioner*. Oxford, UK: Wiley-Blackwell.

Kaye, C. B. (2014). Meaningful reflection: A practical approach. *Principal Leadership, 14*(6), 20-24.

Kompf, M. & Bond, W.R. (1995, April). *Through the looking glass: Some criticisms of reflection.* Paper presented at the American Educational Research Association Annual Meeting, San Francisco, CA.

Mezirow, J. (1990). How critical reflection triggers transformative learning. In Mezirow (Ed.), *Fostering critical reflection in adulthood* (pp. 1-20). Jossey Bass.

National Council on Teacher Quality. (2016). *State timelines for implementing fully developed teacher evaluation system that includes student growth and counts*. Retrieved from http://www.nctq.org/dmsView/Evaluation_Timeline_Brief_Overview

Osterman, K.F. & Kottkamp, R.B. (1993). *Reflective practice for educators: Improving schooling through professional development.* Newbury Park, CA: Sage Publications.

Rodgers, C. (2002). Defining reflection: Another look at John Dewey and reflective thinking. *Teachers College Record*, 104(4), 842-866.

Sandholtz, J.H. & Merseth, K.K. (1992). Collaborating teachers in a professional development school: Inducements and contributions. *Journal of Teacher Education, 43*(4), 308-317.

Schon, D.A. (1983). *The reflective practitioner*. New York: Basic Books.

Schon, D.A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions.* San Francisco, CA: Jossey-Bass Publishers.

Van den Bossche, P. & Beausaert, S. The reflective practitioner: D. Schon. In F. Dochey, D. Gijbels, M. Segers, & P. Van den Dossche (Eds.), *Theories of learning for the workplace: Building blocks for training and professional development programs* (pp. 79-86). New York, NY: Routledge.

Zeichner, K. M. & Liston, D. P. (1996). *Reflective teaching: An introduction*. Lawrence Erlbaum Associates Publishers.

TRAUMA-INFORMED ADULT EDUCATION: AN INTERPRETATIVE PHENOMENOLOGICAL ANALYSIS

Thomas Wartenweiler
thomaswartenweiler@gmail.com

ABSTRACT
The traumatized learner has a more difficult school experience. In an educational setting, academic performance, classroom behavior and social relationships are negatively affected by trauma. The trauma survivor is therefore likely to develop a negative or ambiguous learner identity. Trauma-informed practices in adult education are a relatively new way to create safe learning spaces where traumatized learners can re-shape their learner identity. The purpose of this Interpretative Phenomenological Analysis is to explore how the participants' childhood school experiences and their learner identities inform their experience of an adult educational program that is based on trauma-informed practices. The central thesis is that the educational history of the traumatized learner as well as his or her learner identity are important because they contain clues as to how to help this individual learner best to thrive in the classroom. The results of this study are twofold: First, on an individual basis, each participant found the aspect of the program most beneficial which helped him or her make a positive experience in the area where they had been wounded most in their educational history. Second, four superordinate themes that apply to all participants were identified: no parental support and social struggles at school, an alternative learning identity, and the importance of a safe community in trauma-informed practice. The article concludes by making recommendations for implementing trauma-informed practices in adult education.
Keywords*:* Trauma-informed practice, developmental trauma, learner identity, adult education

INTRODUCTION

'Difficult Students' was a mandatory class in my teacher training in the late nineties. My fellow students and I were taught a variety of strategies to manage student behavior outside of our expectations. I don't remember devoting much thought throughout my early years at university to the question of *why* students would 'misbehave'. In a similar vein, we nowadays have a plethora of new diagnostic labels available to describe students' behavioral, emotional or social disorders. While these labels may be helpful to raise awareness of the need for special attention towards these learners, they nevertheless fail to explore the cause of the disorders. This has been a widely voiced concern about the Diagnostic and Statistical Manual of Mental Disorders (see for example Frances, 2013). Much research, especially in the field of neuroscience (Cozolino, 2013; Perry, 2009; Van der Kolk, 2014), has helped to a much greater degree answer the question why some students are unable to live up to their teachers' expectations, both intellectually as well as socially. One of the factors that emerged is developmental trauma (Van der Kolk, 2014).

This article looks at developmental trauma in an educational context. Acknowledging the impact of trauma on learning is of great importance if we want to create more socially just education systems and not disadvantage traumatized learners. The article explores the childhood school experience of trauma survivors and their learner identities in order to analyze how these affect their experience of a trauma-informed adult educational program. According to a trauma-informed approach, an educator needs to have a sense of 'something happened to the learner that makes him or her vulnerable in my classroom'. The central thesis of this study is therefore that the educational history of the traumatized learner as well as his or her learner identity contain important clues as to how to help this individual learner best thrive in the classroom. The better the trauma-informed educator can identify the key needs of each learner, the better he or she will be able to empower the learner. The first part of the article introduces key research findings in the areas of developmental trauma, trauma-informed practice and learner identity. The next part presents the research process of the study. The final part analyzes the data and shows how past school experiences affect learner identity and the experience of an adult education program. The conclusion offers recommendations of how the trauma-informed classroom can mitigate some of the negative effects of trauma and potentially heal some of the wounds inflicted by former negative school experiences. The study thus contributes in an important way to the small but emerging field of trauma-informed educational research by extending it into the novel area of adult education and by identifying strategies to enhance the trauma-informed adult classroom. The next section of the article looks at recent research on developmental trauma.

Developmental Trauma

The seminal Adverse Childhood Experience study (Felitti et al., 1998) has shed new light on childhood trauma's prevalence and its effects on human well-being. Developmental trauma, defined broadly to include abuse, neglect, attachment disruption and toxic stress (Rahim, 2014; Scaer, 2005; Walkley & Cox, 2013), has emerged

as a factor to explain why some so-called difficult students remain undiagnosed or mis-diagnosed because they are actually traumatized. The negative effects of complex trauma on the developing brain are now well documented (see i.e. Cozolino, 2013; Van der Kolk, 2014). Traumatized children suffer from a complex web of overlapping developmental issues, including 'hyperactivated stress response systems, cognitive biases and deficits, and dysfunctional attachment patterns' (Ellenbogen, Klein & Wekerle, 2014, p.1366). In an educational setting, academic performance, classroom behavior and social relationships are negatively affected (Cole et al., 2005). A traumatized learner's brain is often in 'fight, flight or freeze' mode, focused on immediate survival rather than on learning and cooperation. He or she will observe the teacher and fellow students hyper-vigilantly for any sign of perceived danger (Cozolino, 2013). In light of this, Greene (2014) concludes that these learners are unable rather than unwilling to fulfill the teacher's expectations, and that they would do well if they could. Difficult behavior can therefore be interpreted as the symptom of a formerly useful, but now misguided survival strategy (Cozolino, 2013). The next section of the article looks at how trauma-informed practice (TIP) can be used with traumatized learners.

Trauma-Informed Practice

In light of the research on developmental and complex trauma, the need for service providers to become knowledgeable about trauma has become evident. This has led to the development of the trauma-informed practice approach (also known as trauma-informed care), which has been expanded over the last decade from a social work context into other systems such as juvenile justice, health care and education (Wilson, Pence & Conradi, 2013).

> A trauma-informed perspective recognizes that people who have been chronically abused or neglected may have many possible triggers. These triggers often include situations where clients experience a lack of respect and safety and an absence of control and choice – experiences that often mimic and resonate with past traumatic experiences (Haskell, 2012, pp.9-10).

There are various definitions of what 'trauma-informed' means in an educational context and different frameworks of what constitutes TIP in schools (see i.e. Cole et al, 2005; Ko et al., 2008; Wolpow, Johnson, Hertel & Kincaid, 2011). All have the ultimate goal to create a physically and psychologically safe learning community that allows trauma victims to let down their guard and enables them to focus on learning. Carello and Butler (2015) have developed a framework for the classroom that includes awareness of the following core elements: a) Some students in the classroom may be traumatized, b) some content and assignments may have potential to re-traumatize, c) instructor and student behavior are potentially re-traumatizing, d) classroom characteristics may be unhelpful for traumatized learners, e) self-care for both teacher and students is important. TIP basically asks the question 'what happened to you?' instead of 'what is wrong with you?' (BC Provincial Mental Health and Substance Use Planning Council, 2013, p. 24). The next section of the article looks at how trauma impacts learner identity.

Learner Identity

The negative impact of trauma on learning has only relatively recently been acknowledged. Adult learners who have survived childhood trauma have generally not profited from trauma-informed educators. Their learning history may therefore have resembled Freire's (1970/2000) experience that 'so often do [the oppressed] hear that they are good for nothing, know nothing and are incapable of learning anything—that they are sick, lazy and unproductive—that in the end they become convinced of their own unfitness' (p.63). This will in many cases have impacted and shaped how they see themselves as learners, hence their *learner identity*. Rossiter (1999) conceptualized identity through a narrative lens: 'The self […] really is constituted of the narratives of experience—the stories we tell about ourselves in order to explain ourselves to ourselves' (p. 62). This is in line with Wojecki's (2007) observation that

> concerning the learner; identity is integral. Working from a narrative perspective, the learner affected through wounding learning practices continues to narrate these previous painful experiences from formal schooling, thus, constructing one's identity in relation to participation in learning later in life….The 'wounds', or the internalized experiences of learning, become storied threads which work towards weaving how the individual sees oneself. Often, these stories become the binding themes for individuals, limiting self- actualization (p. 633).

Similarly, Perry (2006) notes that traumatized adult learners may find it difficult to maintain self-esteem in a new learning environment, may feel overwhelmed, inept or helpless, and become angry. They may have a negative learner identity, where 'the classroom triggers memories of failure and shame that might have once driven them from school' (Cozolino & Sprokay, 2006).

TIP in an educational setting can therefore serve as a strategy to create greater equity and reduce inequalities in the classroom by providing extra support for the needs of traumatized learners (Smith, 2012). In a capabilities framework (Nussbaum, 2003), trauma is a factor that diminishes the capability of learners to adequately access

and profit from education. Positive new learning experiences, facilitated by a caring and safe educator, can help the learner reshape his or her learning identity and re-create this capability. The next section of the article looks at TIP principles in an adult education context.

Trauma-Informed Classrooms For Traumatized Adult Learners

Trauma-informed principles are relatively new in educational settings. Their efficiency in mental health and social work with adults (Muskett, 2014), and in education with youth (Morgan, Pendergast, Brown & Heck, 2015) as well as with children, is well documented (Cole et al., 2005; Wolpow et al., 2011). However, no research could be found that evaluates trauma-informed practices in adult education. This study explores such a setting, a life-skills program based on trauma-informed practices offered by an non-profit organization (NPO). (In order to protect the identity and sensitive information of the participants, the name of the NPO is deliberately withheld. Also, the name of the life-skills program has been changed in the participants' quotes below.) The program is for marginalized adults in a neighborhood characterized by a high prevalence of poverty, homelessness, mental health issues and substance abuse in a large Canadian city. It takes place one evening a week for two hours. It is free of charge and on a drop-in basis. The content is geared towards life-skills such as conflict resolution or non-violent communication and social justice issues relevant for the participants (i.e. housing rights). It is enhanced by community activities for participants such as cooking meals together or birthday celebrations. It is a small-scale program with ten to fifteen participants per evening.

METHOD

This study uses the qualitative method of Interpretative Phenomenological Analysis (IPA, Smith, Flowers & Larkin, 2009), which is a formidable tool for giving voice (Larkin, Watts & Clifton, 2006) to people at the margins of society, voices that often go unheard. IPA has an idiographic and phenomenological focus (Pietkiewicz & Smith, 2014), meaning that the interest is on the unique subjective lived experience of each participant, and how the participant makes sense of it (Eatough & Smith, 2006). The relatively small sample size in IPA studies allows for depth in the analysis and to give appropriate weight to the 'gems…the relatively rare utterance that is especially resonant and offers potent analytic leverage for the study' (Smith, 2011, p.6). IPA is based on a constructionist epistemology, acknowledging that the process of meaning making takes place in a double hermeneutic, where the researcher interprets the participants' interpretation of their experience, thus co-creating meaning (Smith & Osborn, 2003). In that sense it is interpretative and implies that there is not one objective truth to be found but that individuals create meaning within their social relationships (Willig, 2001).

Researcher

As a researcher, I am also the Director of the NPO that offers the life-skills program the participants attend. I oversee the program and have known the participants for many years. This study therefore takes place in a practitioner-research context. Due to my closeness to the participants, it has been important to keep a reflexivity journal as proposed by Landridge (2007), especially in regards to power dynamics, my own position, and interests, as Hertz (1997) urges the researcher to do. This journal helped me in my awareness of research participants possibly commenting on the life skill program in a positive fashion to please me. However, their openness and critical comments toward the program during the interviews relativized this concern.

Sampling

IPA requires purposive sampling (recruiting participants who can offer a meaningful insider perspective relevant to the research topic) and a relatively small number of participants in order to generate rich, personal and detailed data. Six participants is a standard sample size for IPA studies (Smith et al., 2009) and allows for giving voice to the individual participants within the constraints of academic writing.

Participants

The participants from the life-skills program that self-identify as abuse survivors (3 years or more of either physical or sexual abuse) and whom I have personally known for at least two years, were approached and invited to participate in the study. 6 volunteers were chosen for the study (see table 1). It later turned out that all participants had grown up with at least one parent who was an alcoholic, which was not a prior inclusion criterion.

Table 1 – Participant Demographics

Name (Pseudonym)	Age	Ethnicity	Marital status	Education	Employment	Addiction background	Abuse sexual / physical
Joe	54	Caucasian	single	Grade 6	Welfare	yes	both
Nicole	31	Caucasian	Married with children	Bachelor	Employed	no	both
Kurt	28	Caucasian	single	Grade 11	Disability	yes	physical
Matt	51	Mixed race	single	High School	Disability	yes	physical
Lynn	62	Mixed race	divorced	High School	Welfare	yes	sexual
Moe	42	Caucasian	single	Grade 11	Disability	no	physical

Ethical Considerations

In the afterword to her seminal work *Trauma and Recovery,* Herman (1997) points out that trauma survivors are often motivated to participate in research in order to help others, yet cautions that researchers need to be aware of the power dynamics when doing research with trauma survivors and advocates for a personal relationship with participants. In light of these recommendations, I decided to only interview participants that I have known for more than two years and with whom I have built a strong personal relationship. Reviewing the literature on trauma research, Legersky and Bunnell (2010) find that trauma survivors participating in research studies only face a minimal risk of re-traumatization and that the benefits (i.e. sense of helping others through their experiences) generally outweigh the risk. This is also reflected in Downes, Kelly and Westmarland's (2014) *positive empowerment* approach which sees victims as 'active agents in making decisions about whether and how to take part' (p. 6) in the research. According to trauma-informed practice principles (BC Provincial Mental Health and Substance Use Planning Council, 2013), I did not ask any direct questions about the participants' abuse history, but let the participants volunteer as much information about the abuse as they wished. It was also important to meet the participants with cultural humility (Yeager & Bauer-Wu, 2013) and not to presume that I could entirely understand their experience or ask the right questions to do their experience justice. As described in more detail in the next section, no ethical issues seemed to arise during the interviewing process.

Data Collection

After ethical approval was obtained from Lancaster University and written consent was given by the participants, I conducted semi-structured interviews with the 6 participants at the life skills training facility. They were recorded and transcribed verbatim. Each interview took between 60 and 90 minutes. Open-ended questions were asked focusing on a) the participants' school experience in retrospect, b) how they presently see themselves as learners and c) how they experience life-skills education in the trauma-informed classroom. While the atmosphere at the interviews was quite relaxed, the gravity of the experiences shared was at times palpable. It was hard for me to hear some of the horrible things that had happened to the participants. However, sharing the stories did not seem to affect the participants negatively. Some participants had difficulties focusing on the questions and would deviate repeatedly from the topic at hand. All participants were willing to share quite vulnerably but also felt free to be critical about certain aspects of the trauma-informed program. One participant (Lynn) told me that she would not have taken part in such a study if she did not know me personally.

Data Analysis

I analyzed the interview transcripts according to IPA standards (Smith et. al, 2009). I read and re-read the transcripts to immerse myself in the participants' experience and to get a general sense of their journey, annotating them with first observations and impressions. I then coded each transcript in detail and looked for subordinate themes within each transcript, which I then clustered into superordinate themes. I repeated this process for each interview and then looked for the seemingly most prominent superordinate themes across all cases. My personal observations in the trauma-informed classroom and my past informal conversations with the participants served as a helpful guide through this process. I also presented the findings in anonymised form to some key staff of the program for feedback.

During the analysis, it became clear that there were some obvious inconsistencies and contradictions in the participants' accounts. However, I was less concerned with verifying the truth of each account as with exploring how the participants' account shaped their present learner identity and their experience of a trauma-informed classroom. According to Power (2004) 'an interpretive analysis offers qualitative researchers a satisfying, if never certain or unambiguous, way of understanding apparently contradictory remarks' (p. 859).

FINDINGS AND DISCUSSION

Themes in Individual Cases

While analyzing the data, I found that there was one prominent recurring theme of struggle in each participant's account of his or her educational history. It is precisely this theme of struggle that each participant brought into the trauma-informed classroom. Except for Moe, all participants reported that what they found most helpful in the trauma-informed setting was that they could make positive experiences in the area where they had been wounded most. This reflects a key tenant of Hendrix's (1996) imago relationship therapy, namely that 'since the wounding occurred in relationship…the healing [can] occur only in a context which reactivate[s] the wounds' (p. 5). This section will identify the key need of each participant based on his or her personal struggle.

Joe – lack of love versus love

Joe, who grew up with an alcoholic single dad, in the foster system and in juvenile correctional centers for most of his life, mentioned five times during the interview that he was not brought up right and three times that he did not experience any love as a child, from his parents or in school. **'**If you are not raised with love, you turn out broken-hearted.' Joe is very distrustful of people and believes that everybody is out to get him. This paranoia could be due to insecure attachment as a child (Pickering, Simpson & Bentall, 2008). His strategy of causing trouble at school in order to be sent to a more favorable place can be seen as hidden resilience (Ungar, 2008). In contrast, Joe especially appreciated the staff at the life skills program.

> Curt and Nina [JustWorld staff], I just love watching them raise their kids…I guess I just never had that. That's why I gravitate to that so much I guess….Just watching this, I fell in love with it, it just broke my heart. It's weird how that works. I'm a hardcore looking guy with tattoos all over my body, I just see that and I just melt. It's weird.

For Joe, it is therefore mainly the personal relationship with the staff that draws him to the program, where he sees love in action. A key need for Joe to be met in the trauma-informed classroom is therefore *loving relationships*.

Nicole –criticism versus affirmation

Nicole grew up with a verbally, physically and sexually abusive alcoholic stepfather and felt constantly afraid of doing something wrong and getting in trouble for it. She was a good student and the only participant who enjoyed the academic side of her school experience as a child, which was a reprieve from home:

> Home life felt more like oppressive, or like negative…being criticized, and so in some ways at school – and that is probably why I enjoyed it so much – I was affirmed….At home any kind of mistake or shortcoming was seen as a weakness and a devaluing of my personhood and of who I was and my worth. I think I can easily equate my achievement with my worth, and so that's why it feels so risky to then try to attempt something that I will not with most certainty be a high achiever at, and so being mediocre then means that I am essentially mediocre.

Feeling anxious about failure, and the possibility of criticism and rejection, what she most appreciates about the life skills program is:

> Because there is a number of people coming from more difficult backgrounds or less academic backgrounds, I think that definitely helps to decrease any kind of anxiety or pressure to know more, be smarter than you actually are. So that's really freeing to actually engage with what's being learned.

Nicole mainly enjoys that the trauma-informed classroom is not a competitive environment but has much more of a cooperative and affirming feel to it. An important need for Nicole in the trauma-informed classroom for Nicole is *affirmation*.

Kurt – being an outsider versus being accepted

Kurt 'hated school' because he was relentlessly bullied by other students:

> At home I knew what kind of abuse to expect whereas at school it could have been anything….There was always this anxiety and fear around my classmates and you know, I had no friends.

He reported that what he really liked about the life skills program was:

> I feel very accepted. Because you know, that is kind of the point of JustWorld, is to accept everybody. If I was not accepted, I would not be here. And it makes it *that* much easier to learn. You can focus.

What Kurt reflects in his account is the importance of belonging and acceptance for the traumatized learner in an educational setting in order to be able to relax and focus. The greatest need for Kurt in the trauma-informed classroom is therefore *acceptance*.

Matt – instable school history versus staff turnover
Matt grew up with alcoholic parents and moved around a lot during his school years. He said that school was 'a pain in the ass [because] I got bullied. And moving from school to school….It was just like as soon as you got into a friendship with somebody, you're gone, you're moving. It was constant.' This theme of not being able to connect with fellow students or teachers on a deeper level was the one thing he struggled most with in our trauma-informed program:

> To see so many people leave and go on that were actually part of [the staff] has been tough. You get attached to them as friends and then they go away and kind of disappear….Yeah, there are so many of them, they are gone, the constant turnover.

Matt's quote illuminates that in order to have a safe learning space, continuity in relationships is of great importance. High staff turnover is therefore definitely problematic for a trauma-informed educational program. Matt would probably identify *stable relationships with staff* as an important need of his in the trauma-informed classroom.

Lynn – vulnerable versus protected
Lynn, who was severely abused in a Canadian residential school (for an exploration of trauma in residential schools, see Elias et al., 2012), touches on the sense of being vulnerable and helpless throughout her school experience. She recalls a conversation with a doctor about her sexual abuse: 'You don't know what's going on behind those doors. Once those gates close, all hell breaks loose….We were like lambs going to the slaughterhouse, that's how I felt.' She then contrasts this later in the interview with the trauma-informed program: 'JustWorld [staff are] like shepherds and they are watching over their lost sheep.' This contrast between being a vulnerable lamb that is slaughtered and later the staff that watch over the sheep shows a deep appreciation for how the staff care for their students and how Lynn feels safe. Having a *safe space* is the key need for Lynn.

Moe – distrust
Moe's account shows a deep distrust for authority in general and for teachers in particular. He was put into special education classes throughout his school career and always felt like having been put in the wrong program. He recounted one particularly emotional experience:

> [The teacher] kept on saying I was cheating. Seriously, I tried to kill her. I jumped on the table and went over and started choking her. That was how pissed-off I was. Because she said I was cheating, because 'there is no way some retard from special ed can get these marks'. That's when I just lost it.

When asked about his experiences in the trauma-informed classroom, Moe didn't seem to have been able to entirely shake his distrust towards the staff:

> M: There is some stuff I don't agree with, I just don't bring it up.
> I: You think it would not be safe to share your opinions?
> M: Well, yeah.
> I: So you feel like during discussions, not everybody is always free to say what they think?
> M: I don't know. I just think instead of making it a bigger conflict, I prefer to keep quiet about it.

Moe had been coming to the program for 6 years. His case shows that TIP is not a panacea for the traumatized learner and that some of the needs cannot be met easily even over a long period of time. We can identify *trusting relationships* as Moe's key need in the trauma-informed classroom.

What all the six cases show is that the past school experience has a profound influence on how the learner approaches the adult education classroom. The past hurtful experiences are projected on the present learning situation, which is in line with Perry's (2006) and Cozolino and Sprokay's (2006) findings. The wounding that was inflicted in the early years of school would need to be healed through positive experiences in the same area. In their differences, the six cases highlight that each learner brings his or her individual struggles to the classroom, and therefore different aspects of the program are most meaningful to them. The following elements can be teased out from these participants as crucial for trauma-informed adult education: loving relationships (Joe), affirming teachers (Nicole), an accepting learning community (Kurt), a safe learning space (Lynn), stable relationships with staff (Matt), and building trust (Moe). This shows the importance of approaching the traumatized learners with the mindset of 'what happened to you?' and to see learners as individuals with their individual story and individual needs. Finding out about the learners' individual needs is crucial.

Themes Across Cases

During the data analysis, I identified four superordinate themes that were present in at least five of the six cases: no parental support, social struggle at school, an alternative learner identity, and the trauma-informed classroom as a safe community.

No parental support

All participants reported that they did not receive adequate support at school from their parents.

> 'They didn't give a shit. They didn't care. They didn't care at all. Half the time they didn't even know whether I was going to school or not.' (Kurt)

Schwerdtfeger Gallus, Shreffler, Merten and Cox (2014) note that 'the perceived presence of parental support and care may be critical to youth adjustment following a range of interpersonal traumatic experiences' (p.995). Lee and Bowen (2006) found that parental school involvement and parental educational expectations have a significant influence on their children's educational achievement. The parental abuse resulted not only in developmental trauma for the participants of this study but also in a disturbed parent-child relationship with a direct influence on perceived parental support and parental educational expectations. The abuse had therefore a double negative impact: The learner would struggle both directly from the trauma and indirectly from a lack of parental support in their education. The learners will therefore carry this sense of lacking support into the adult classroom and will appreciate the educator's supportive relationship.

Social struggles

Another theme that was present in all accounts was that of social struggle at school. All four male participants reported having been bullied in primary school and having been involved in fights in high school. 'So that was basically my entire high school, was a series of me fighting and getting in trouble and skipping school' (Kurt). This is in line with Shields and Cicchetti (2001) finding that maltreatment (physical and sexual abuse) makes children more vulnerable to becoming victims of bullying. Both women struggled with social acceptance. Nicole recalls: 'I was socially awkward….I was so shy, it was hard to make friends and I was very dependent on other kids just saying 'hey, join us', you know.' This is confirmed in research (Ferguson, McLeod & Horwood, 2013; Sperry & Widom, 2013) that shows a link between child abuse and low self-esteem.

All participants except for Nicole had predominantly strained relationships with their teachers. Schwerdtfeger Gallus et al. (2015) observe that 'perceptions of support and safety within the school environment, frequently referred to as school connectedness, have been found to be positively related to self-esteem, academic achievement, and motivation' (p.995). It is clear that most participants did not have a good sense of school connectedness but on the contrary, their school experience was harmful for their development. Except for Nicole, they all seem to have become double victims of domestic violence and, in Francis and Mills' (2012) words, 'schools as damaging organizations'. They will carry this sense of low self-esteem and victimization into the adult classroom and will therefore especially appreciate a sense of supportive community.

We are smart

The impact of developmental trauma, difficult school experiences and little parental support are reflected in the participants' educational achievements. Only Nicole and Matt graduated from high school. However, in contrast to Cozolino and Sprokay's (2006) observation that 'when [traumatized] students examine their emotional learning state, their self-identity as poor learners is often revealed and their shame triggered' (p. 14), all participants created an alternative learner identity of being smart or capable, even if it is not necessarily in an academic sense, as the following quotes show: 'I was just a little bit slow at some stuff, but that didn't make me

stupid' (Moe). 'I was actually really smart' (Joe). 'In terms of learning auditorily, I'm a genius' (Kurt). 'When people show me things, I learn what they know and how they do it. Equate it out for myself and see if that's actually a reasonable way of doing things or not' (Matt). **'**The teacher said: '[you] are the dumb ones.' They call us dumb because we're not thinking like them….I don't think I'm dumb…I find myself smart.'(Lynn)

This alternative learner identity comes close to what Hatt (2007) calls 'street smart vs. book smart' of marginalized urban youth: ' 'Street smarts' are more important because they are connected to being able to maneuver through structures in their lives such as poverty, the police, street culture, and abusive 'others' ' (p.145). It seems that this alternative learner identity might be used by the participants to partly compensate for some of the academic underachievement and to re-direct some of the responsibility towards the teachers, institutions and parents that failed them. It is also possible that there is some shame in their academic failure, and they wanted to portray themselves in a more positive light to the interviewer. However, the important finding here for trauma-informed adult education is that while the learners see themselves as competent, for most of them it is not in the academic sense. This needs to be taken into consideration in order to not overextend them academically and thus damage their fragile learner identities.

A safe community

The final common theme in the participants' accounts was that all except for Moe appreciated the trauma-informed classroom as a safe and supportive learning community. This is highly relevant in light of their personal experience of not being supported either at home or at school in the past.

> I love coming here because there are a lot of people I can love….I see a lot of people coming here when they are having problems. And I think that is good, that they trust [the staff] enough to come here and say 'this is what I need'. (Lynn)
>
> There is definitely a sense of community in regards to mutual respect and there is definitely an attempt to connect and build friendship with each other, so there is a more personal kind of relating that you don't see in other settings. (Nicole)
>
> Just the people. The relationship building. Just the sense of family and belonging. And we always seem to have a really good time. (Matt)
>
> If it wasn't for JustWorld, I wouldn't know what to do, because I got absolutely no one to talk to down here. So with me having JustWorld down here has been a life line for me, and I thank [the staff] for that. (Joe)
>
> I mean I know that for one, it's a safe place. It's a place where my opinion is allowed…and I think that's what allows people to learn much better….In order for me to ask a question, I have to show part of myself. And in order to receive an answer, you have to show a part of yourself. And it brings together a community. (Kurt)

Research shows how important belonging is for school success (Lam, Chen, Zhang & Liang, 2015; Ostermann, 2000) and for generally doing well in life (Schonert-Reichl & LeRose, 2008). Belonging is seen as a fundamental aspect of creating 'school as community' (Furman, 2012). Also, the accounts highlight the importance of safe, personal relationships where no one asks 'what's wrong with you?' but instead, according to trauma-informed practice, 'what happened to you?', showing a genuine interest in the persons and a sensitivity towards their difficult life stories. The trauma-informed approach then seems to be able to provide this safety and sense of community that helps the traumatized learner to enjoy participating in an educational program.

CONCLUSIONS

The themes identified in this study confirm to a great degree what we know about many traumatized learners: They have both social and cognitive difficulties in the classroom. All participants struggled socially in school, both in relating with peers as well as with the majority of teachers. While the participants created alternative identities of being 'smart', most of them nevertheless underperformed academically. Only two out of six graduated from high school and only one went on to get a tertiary education. In addition, these victims of domestic abuse were doubly punished as they missed out on the important parental school support. Each participant carried a predominant theme, an unmet need from their early school experience, into the trauma-informed classroom. Their accounts of how they experienced the trauma-informed setting are encouraging. At least some of their needs seem to have been met. A safe community and a relationship-oriented educational program seem to create a learning platform where the traumatized learner can thrive.

Based on the results of this study, the following recommendations can be made for successfully implementing trauma-informed practices in adult education: a) each learner must be seen as an individual, with specific wounds inflicted by unique personal circumstances. Being mindful that 'something happened to you that makes you vulnerable in this educational setting' should be a key attitude of the trauma-informed educator. It is not the role of the educator to actively find out the details of the abuse. According to trauma-informed practice, the trauma survivors should volunteer any information about their trauma. However, a key to success is to find out what the greatest individual *need* is (i.e. affirmation, safety, acceptance etc.) and to meet this need as best as possible in the classroom. b) We therefore see that a big part of trauma-informed practices has less to do with techniques than with relational skills. Vulnerability, openness, self-reflection and genuine interest in the learner are the foundation of trauma-informed practice. Only if the educator is a safe person, can he or she create a safe space for others. This requires personal introspection. Questions such as 'What situations prevent me from being loving, affirming and safe?' or even 'What are the wounds I carry from my own educational history?' need to be asked and ways need to be found to grow in personal awareness and self-care. c) Working with traumatized adult learners shifts the focus in the adult classroom from content to relationship. The traumatized learner will not be able to learn if his or her deeper needs are not met.

Limitations

This study focused on the lived experience of six participants in one particular adult education program. The intent was to communicate a few personal perspectives of 'what is working'. While we get a good sense of what strategies to implement in a trauma-informed adult classroom, some of these findings may not be transferrable to other trauma-informed programs. As trauma-informed adult education is a new field, much further research is needed, both in evaluating trauma-informed adult education programs, as well as in quantitative studies that explore in more detail what elements and factors of the trauma-informed approach work in all adult education programs.

REFERENCES

BC Provincial Mental Health and Substance Use Planning Council. (2013). *Trauma-informed practice guide.* Retrieved from: http://bccewh.bc.ca/wp-content/uploads/2012/05/2013_TIP-Guide.pdf

Carello, J. & Butler, L. D. (2015) Practicing what we teach: Trauma- informed educational practice. *Journal of Teaching in Social Work*, *35*(3), 262-278, doi: 10.1080/08841233.2015.1030059

Cole, S. F., Greenwald O'Brien, J., Gadd, M. G., Ristuccia, J., Wallace, D. L., Gregory, M. (2005). *Helping traumatized children learn. Supportive school environments for children traumatized by family violence.* Boston, MA: Massachusetts Advocates for Children.

Cozolino, L. (2013). *The social neuroscience of education: Optimizing attachment & learning in the classroom.* New York, NY: Norton.

Cozolino, L. and Sprokay, S. (2006), Neuroscience and adult learning. *New Directions for Adult and Continuing Education*, *2006*, 11–19. doi: 10.1002/ace.214

Downes, J., Kelly, L. & Westmarland, N. (2014). Ethics in violence and abuse research – a positive empowerment approach. *Sociological Research Online, 19*(1), 2, doi: 10.5153/sro.3140

Eatough, V., & Smith, J. (2006). I was like a wild wild person: Understanding feelings of anger using interpretative phenomenological analysis. *British Journal of Psychology*, *97*(4), 483-498.

Elias, B., Mignone, J., Hall, M., Hong, S. P., Hart, L., & Sareen, J. (2012). Trauma and suicide behaviour histories among a Canadian indigenous population: an empirical exploration of the potential role of Canada's residential school system. *Social Science & Medicine*, *74*(10), 1560-1569.

Ellenbogen, S., Klein, B. & Wekerle, C. (2014) Early childhood education as a resilience intervention for maltreated children, *Early Child Development and Care*, *184*(9-10), 1364-1377. doi: 10.1080/03004430.2014.916076

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., … Marks, J. S. (1998). . Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine 14*(4), 245–258.

Fergusson, D. M., McLeod, G. F., & Horwood, L. J. (2013). Childhood sexual abuse and adult developmental outcomes: Findings from a 30-year longitudinal study in New Zealand. *Child Abuse & Neglect*, *37*(9), 664-674.

Frances, A. (2013). *Saving normal.* New York, NY: William Morrow.

Francis, B., & Mills, M. (2012). Schools as damaging organisations: Instigating a dialogue concerning alternative models of schooling. *Pedagogy, Culture & Society*, *20*(2), 251-271.

Freire, P. (2010). *Pedagogy of the Oppressed. 30th Anniversary Edition*. New York, NY: Bloomsbury. (Original work published 1970).

Furman, G. (Ed.). (2012). *School as community: From promise to practice*. New York NY: SUNY Press.

Greene, R. (2014). *Lost at school: Why our kids with behavioural challenges are falling though the cracks and how we can help them.* New York, NY: Scribner.

Haskell, L. (2012). A developmental understanding of complex trauma. In Poole, N. & Greaves, L. (Eds.). (2012). *Becoming trauma informed*. Toronto: Center for Addiction and Mental Health.

Hatt, B. (2007). Street smarts vs. book smarts: The figured world of smartness in the lives of marginalized, urban youth. *The Urban Review*, *39*(2), 145-166.

Hendrix, H. (1996). The evolution of imago relationship therapy: A personal and professional journey. *Journal of Imago Relationship Therapy*, *1*(1), 1-17.

Herman, J. L. (1997). *Trauma and recovery. The aftermath of violence-from domestic abuse to political terror.* New York, NY: Basic Books.

Hertz, R. (ed.) (1997) *Reflexivity and Voice*. Thousand Oaks, CA: Sage.

Ko, S. J., Ford, J. D., Kassam-Adams, N., Berkowitz, S. J., Wilson, C., Wong, M., … Layne, C. M. (2008). Creating trauma-informed systems: Child welfare, education, first responders, health care, juvenile justice. *Professional Psychology: Research and Practice*, *39*(4), 396–404. doi:10.1037/0735-7028.39.4.396

Lam, U. F., Chen, W. W., Zhang, J., & Liang, T. (2015). It feels good to learn where I belong: School belonging, academic emotions, and academic achievement in adolescents. *School Psychology International*, *36*(4) 393–409. doi: 10.1177/0143034315589649

Landridge, D. (2007). *Phenomenological psychology: Theory, research and method.* Essex: Pearson Education Limited.

Larkin, M., Watts S. & Clifton E. (2006). Giving voice and making sense in interpretative phenomenological analysis. *Qualitative Research in Psychology*, *3*, 102–120.

Lee, J. S., & Bowen, N. K. (2006). Parent involvement, cultural capital, and the achievement gap among elementary school children. *American Educational Research Journal*, *43*(2), 193-218.

Legerski J.-P. & Bunnell, S. L. (2010) The risks, benefits, and ethics of trauma-focused research participation, *Ethics & Behavior*, *20*(6), 429-442, doi: 10.1080/10508422.2010.521443

Morgan, A., Pendergast, D., Brown, R., & Heck, D. (2015). Relational ways of being an educator: trauma-informed practice supporting disenfranchised young people. *International Journal of Inclusive Education*, *19*(10), 1037-1051.

Muskett, C. (2014). Trauma-informed care in inpatient mental health settings: A review of the literature. *International Journal of Mental Health Nursing, 23*(1), 51-59.

Nussbaum, M. (2003). Capabilities as fundamental entitlements: Sen and social justice. *Feminist Economics, 9*(2-3), 33-59, doi: 10.1080/1354570022000077926

Osterman, K. F. (2000). Students' need for belonging in the school community. *Review of educational research*, *70*(3), 323-367.

Perry, B. D. (2006). Fear and learning: Trauma-related factors in the adult education process. *New Directions for Adult and Continuing Education, 2006*(110), 21-27. doi: 10.1002/ace.215

Perry. B. D. (2009) Examining child maltreatment through a neurodevelopmental lens: Clinical applications of the neurosequential model of therapeutics, *Journal of Loss and Trauma*, *14*(4), 240-255. doi: 10.1080/15325020903004350

Pickering, L., Simpson, J., & Bentall, R. P. (2008). Insecure attachment predicts proneness to paranoia but not hallucinations. *Personality and Individual Differences*, *44*(5), 1212-1224.

Pietkiewicz, I., & Smith, J. A. (2014). A practical guide to using Interpretative Phenomenological Analysis in qualitative research psychology. *Psychological Journal*, *20*(1), 7-14.

Power, E. M. (2004). Toward understanding in postmodern interview analysis: Interpreting the contradictory remarks of a research participant. *Qualitative Health Research*, *14*(6), 858-865.

Rahim, M. (2014). Developmental trauma disorder: An attachment-based perspective. *Clinical Child Psychology and Psychiatry*, *19*(4), 548–560. doi:10.1177/1359104514534947

Rossiter, M. (1999). A narrative approach to development: Implications for adult education. *Adult Education Quarterly, 50*(1), 56-71.

Scaer, R. (2005). *The trauma spectrum: Hidden wounds and human resiliency.* New York, NY: Norton.

Schonert-Reichl, K., & LeRose, M. (2008). Considering resilience in children and youth: Fostering positive adaptation and competence in schools, families and communities. *Unpublished paper: Discussion paper for the Learning Partnership*.

Schwerdtfeger Gallus, K. L., Shreffler, K. M., Merten, M. J., & Cox, R. B. (2014). Interpersonal trauma and depressive symptoms in early adolescents: Exploring the moderating roles of parent and school connectedness. *The Journal of Early Adolescence*, *35*(7) 990–1013 doi: 10.1177/0272431614548067

Shields, A. & Cicchetti, D. (2001). Parental maltreatment and emotion dysregulation as risk factors for bullying and victimization in middle childhood. *Journal of Clinical Child & Adolescent Psychology, 30*(3), 349-363, doi: 10.1207/S15374424JCCP3003_7

Smith, E. (2012). An introduction to social justice. In *Key issues in education and social justice.* London, England: Sage.

Smith, J. A. (2011). We could be diving for pearls: The value of the gem in experiential qualitative psychology. *Qualitative Methods in Psychology Bulletin*, *12*, 6-15.

Smith, J. A. & Osborn, M. (2003). Interpretive phenomenological analysis. In J.A. Smith (Ed.) *Qualitative psychology: A practical guide to research methods* (pp.51-80). London: Sage.

Smith, J. A., Flowers, P., & Larkin, M. (2009) *Interpretative Phenomenological Analysis: Theory, Method and Research.* London: Sage.

Sperry, D. M., & Widom, C. S. (2013). Child abuse and neglect, social support, and psychopathology in adulthood: A prospective investigation. *Child Abuse & Neglect*, *37*(6), 415-425.

Ungar, M. (2008). Resilience across cultures. *British journal of social work*, *38*(2), 218-235.

Van der Kolk, B. (2014). *The body keeps the score: Brain, mind, and body in the healing of trauma.* New York, NY: Penguin.

Walkley, M., & Cox, T. L. (2013). Building trauma-informed schools and communities. *Children and Schools*, *35*(2), 123–126. doi:10.1093/cs/cdt007

Willig, C. (2001). Introducing qualitative research in psychology: Adventures in theory and method. *Qualitative Research*, *2nd*, 217. doi:10.1177/1468794106058877

Wilson, C., Pence, D. M., & Conradi, L. (2013). Trauma-Informed Care. *Encyclopedia of Social Work.* National Association of Social Workers and Oxford University Press. doi:10.1093/acrefore/9780199975839.013.1063

Wojecki, A. (2007). Adult learners and the identities they tell: Pedagogic spaces for inviting new tales. *Learning in Community*, 631-636.

Wolpow, R., Johnson, M. M., Hertel, R., & Kincaid, S. (2011). *The heart of learning and teaching: Compassion, resiliency, and academic success* (2nd ed.). Retrieved from http://www.k12.wa.us/CompassionateSchools/Resources.aspx

Yeager, K. A. & Bauer-Wu, S. (2013). Cultural humility. Essential foundation for clinical researchers. *Applied Nursing Research, 26* (4), 251-256.

