RELIABILITY AND PREDICTIVE VALIDITY OF THE *ADULT HIGH SCHOOL COMPLETION PROJECT-BASED LEARNING INSTRUMENT*

by

INGRID MACON

DISSERTATION

Submitted to the Graduate School of

Wayne State University,

Detroit, Michigan

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

2018

MAJOR: EDUCATION (Quantitative Methods of Evaluation and Research)

Approved By:

_____

Advisor Date

_____

_____

_____

DEDICATION

To scholars and their quest for knowledge. Then, now, and forever.

In memory of Dr. Gail Fahoome. Thank you for the encouragement to pursue this degree.

ACKNOWLEDGEMENTS

Thank You Lord for Your love and guidance.

Thank you to my friends and family, especially my parents Myrtice Macon, M.D. and Charlesfontaine Macon, D.Min., for setting an example and all your support.

Thank you Professor Sawilowsky, my dissertation committee, and Dr. Geraldine Sumpter for granting me this distinction.

Thank you Wayne State University and Detroit Public Schools Community District for allowing me to conduct this research.

Thank you to my students for inspiring me.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

On June 27, 2016 Governor Snyder approved Michigan Public Act 249. Section (4)(6) stipulated there are three options for adults who are seeking to earn their high school equivalence diploma. They are: the *General Educational Development* (GED), *Test Assessing Secondary Completion* (TASC), and *High School Equivalency Test* (HiSET). They are mostly multiple choice, computerized or pencil-and-paper, standardized tests. Different assessment methods, such as oral assessments, portfolios, and project-based learning, cannot be used to earn a high school equivalence diploma. The single test format may pose a problem for students who cannot take standardized tests due to test-taking anxiety (Duty, Christian, Loftus, & Zappi, 2016), or cannot function optimally because they find traditional classrooms and assessments boring (Acee et. al, 2010), which places them at a disadvantage. Even though traditional high school students can earn their high school diploma through alternative assessment methods in certain circumstances (Thurnlow, Cormier, & Vang, 2009), no such option exists for adult high school equivalence students. Due to the fact that adult high school equivalence students are only allowed one assessment method, their education is not truly high school equivalency.

Gardner (2006) argued students have historically been assessed in the same manner. This may seem fair, but "it privileges those who have strong linguistic and logical-mathematical intelligences, whereas it makes school difficult for the many among us who exhibit somewhat different profiles" (p.56) even if the students possess the knowledge and skills a test assesses. To remedy this, Gardner proposed diminishing the use of standardized tests, and instead to use projects to demonstrate mastery of learning objectives to determine students' "command of factual knowledge, mastery of concepts, and skills in deploying the standard curriculum" (Gardner, 2006, p.116 – 117).

The practice of using projects to demonstrate mastery of learning objectives is commonly known as project-based learning (PBL). It is the process by which students learn the content within a context of an authentic problem they need to solve or a theory that needs to be explained (Savery, 2006). In the process of solving a problem or explaining a theory, they uncover the gaps in their knowledge and research ways in which to bridge their knowledge gaps (Remijan, 2016). More concretely, "the problem is the focus for acquiring knowledge and fosters flexible thinking… The use of problems in PBL makes learning in PBL a constructive and contextual process" (Dolmans, Grave, Wolfhagen, & Van Der Vleuten, 2005, p.734,). There were mixed results of the success of PBL in comparison to more traditional methods (Dolmans, Grave, Wolfhagen, & Van Der Vleuten, p.734, 2005). Nevertheless, PBL is used as an assessment tool extensively in elementary, and high schools (Slavin, 1990), higher education (Dolmans et. al, 2005), and most notably in medical schools (Jang & Park, 2016).

Adult education practitioners have advocated for PBL assessment as a means to earn a high school diploma since Wrigley (1998), who stated PBL in the context of adult literacy programs is a performance-based assessment method that builds the skills and problem-solving strategies supported by the Secretary of Labor's Commission on Necessary Skills (SCANS). Because there were no large scale studies that compared the efficacy of PBL in comparison to traditional adult education literacy methods, there was no confirmation that PBL was more successful than traditional methods.

Knowles (1998) advocated for differential approaches to education as it pertains to adults. The field of education as it pertains to adults is known as andragogy. Traditional education is teacher-led, where the teacher determines the learning objectives, method of instruction, and assessment method. However traditional education in the context of adults, "imposed structure

conflicts with the adult's deep psychological need to be self-directing and may induce resistance, apathy, or withdrawal" (Knowles, 1998, p.212). This feeling of pressure, loss of autonomy, and low relevance to students' lives is a contributing factor of attrition rates (Wilson, 1980). Knowles' theory on andragogy coincides with the experience of adult high school equivalence students' in preparing for high stakes tests such as the widely used GED. Instead of freely writing and being evaluated on matters that immediately pertain to students' everyday lives, they are forced to study prechosen topics. For example, instead of concentrating on everyday math such as taxes, discounts etc., they are forced to focus on formulas such as the Pythagorean Theorem, which they likely will never encounter in their daily lives in any consequential way. Contrary to traditional education standards, it is important for adults' education to relate to their lives more than what will be on the test in order to increase students' success rates and decrease student attrition rates.

PBL is a way to base learning on students' interests and relevance to their lives. Knowles (1998) wrote "perhaps no aspect of andragogy has received so much attention and debate as the premise that adults are self-directed learners. That adults can and do engage in self-directed learning (SDL) is now a foregone conclusion in adult learning research" (p.135). Because of adult learners' experiences as independently functioning individuals, many of whom have had various life experiences including holding a regular job, parenting, etc., the accumulation of their experiences can enhance their education if they are given an avenue to explore and develop their thoughts. Adult learners are in a category of their own because of their accumulation of life experiences that add to the complexity of how they view life and process new information.

SDL might not apply to all adult learners in all contexts. Knowles (1998) noted "the assumption that all adults have full capacity for self-teaching and personal autonomy in every learning situation is generally not accepted. A learner in a learning situation is likely to exhibit

different capacities and preferences" (p.136). Therefore, PBL assessment is not necessarily appropriate for all adult high school equivalence students. Instead PBL should be offered as an option as opposed to a mandate. The question remains how teachers and educational administrators can suggest the educational path that demonstrates the most promise for each individual student.

Considering many adult learners thrive in self-directed learning situations where they are more in control of the learning process, it is worth investigating PBL assessment in adult high school equivalence programs. However, before establishing PBL assessment programs for adult high school equivalence students, it must be determined whether such a population exists that would benefit from PBL assessment, not only in theory. Successful completion of a PBL curriculum requires a particular type of students with a specific disposition toward learning and a specialized skill set.

Similarities and differences of PBL in different academic settings

Mergendoller, Maxwell, & Bellisimo (2006) modeled the use of PBL in medical schools and applied this technique in high school economics classes given that "little research has been conducted within high schools comparing the effectiveness of PBL and traditional instructional approaches" (p.51). They noted there were key differences between medical school students and high school students which could be problematic in an attempt to generalize the results of PBL with medical school students to high school students. First, "medical students are an elite group with superior verbal and quantitative skills" (p.51). A teacher or educational administrator might need to take into consideration the academic aptitude of the chosen population before deducing whether a technique that works in medical school will work well in high school.

Second, "[medical school students] are older than high-school students, and their intellectual development has progressed further. They are, presumably, more experienced with and

accomplished in the use of hypothetical-deductive reasoning" (Mergendoller, Maxwell, & Bellisimo, 2006, p.51). When comparing the groups, a difference in age lends itself to the presumption of a difference in maturity on average. Third, "[Medical school students] have *chosen* to attend medical school, and they view their training as instrumental to future occupational success" (Mergendoller, Maxwell, & Bellisimo, 2006, p.51). Motivation and interest in school might pose issues to generalizability as well.

The characteristics that predict candidates for PBL in post-secondary and secondary settings would be a useful springboard to adult high school equivalence students because this population shares some of the characteristics of medical students and high school students. On the first point of comparison, academic aptitude, high school students and adult high school equivalence students are on the same level because both groups are preparing for a high school equivalence diploma. Unlike medical school students, one of the greatest hurdles for adult high school equivalence students as a group was academic struggles in high school (Wilson, 1980). On the second point of comparison, age and life experiences, adult high school equivalence students are on the level of medical school students. Adult high school equivalence students' level of the use of hypothetical-deductive reasoning might vary from student to student. On the third point of comparison, the choice of being in school, adult high school equivalence students have the same choice of enrollment as medical school students because both groups are legal adults. School is optional for them. Unless adult high school equivalence students are required to attend school as a stipulation of probation or parole they have enrolled in school for their own professional or personal goals (Burgess, 1971; Rothes, Lemon, & Goncalves, 2017). But the majority of adult high school equivalence students are not in the criminal justice system. There are no laws requiring adult high school equivalence students or medical students to go to school as there are for

secondary students.

Unlike high school and medical school students, adult high school equivalence students are under no externally mandated timeline. The only time constraints are self-imposed. Yet, “in medical school, students are required to acquire a vast amount of knowledge in a limited time” (Jang & Park, 2016, p.1369). Medical school students and high school students have a definite cut off period while adult high school equivalence students do not. Patience and tolerance for ambiguity are characteristics adult high school equivalence students must possess in order to perform well in PBL because if they get frustrated, they can quit with no consequence other than not earning their degree. Medical students will have a considerable amount of debt they would unlike be able to repay if they quit. If high school students do not complete school they will be classified as truant with legal consequences for them or their parents. Therefore medical students and high school students are less likely to leave school prematurely.

Problem Statement: The need for a new instrument

Given the dual existence of adult high school equivalence students on points of comparison between secondary and post-secondary students, this lends itself to further investigation into whether PBL is a viable, pedagogically sound, and effective assessment technique for adult high school equivalence students. PBL might not be appropriate for all adult high school equivalence students because some are sufficient test takers and would prefer to participate in traditional classes to pass the test in a shorter amount of time than a PBL assessment (Furnham et al., 2011). This necessitates a unique Likert scaled instrument that will predict which adult high school equivalency students will likely succeed using a PBL assessment based on the learning style and personality factors that are necessary for success in a PBL environment.

There are instruments that assess the efficacy of PBL as an assessment tool as well as

characteristics of post-secondary and traditional secondary students to predict who will do well with project-based learning (Bédard et al., 2012; Jang & Park, 2006; Mergendoller, J., Maxwell, N., Bellisimo, Y., 2006). However, no similar instrument exists for adult high school equivalence students because no such PBL degree conferring program exists. If a program were developed that used PBL to grant adults a high school equivalence diploma, it would be important to determine which students would be the best candidates for said program as opposed to the traditional GED, HiSET or TASC. It is necessary to create an entirely new instrument to measure characteristics of adult high school equivalence students that predict high success rates in a PBL curriculum instead of using an inventory designed for medical students or high school students due to the differences in the populations. Therefore, the purpose of this study is to develop a Likert scaled instrument, called the *Adult High School Completion Project-Based Learning Instrument* (APBLI), and determine its reliability and predictive validity. This instrument will be useful for determining which adult high school equivalency students will likely succeed using a PBL assessment based on the learning style and personality factors that are necessary for success in a PBL environment.

Significance of the Problem

The problem with adult high school equivalency programs only offering pencil-and-paper or computerized one-time assessments is that it limits the methods which students can use to demonstrate their knowledge. This issue severely limits students who have previously encountered either a critical life event, limited proficiency in at least one core subject, or were disengaged in school which prevented them from acquiring their high school diploma. Giving these students more options to demonstrate their knowledge would increase their chances of obtaining their high school equivalence diploma as well as creating an equal education to their secondary counterparts.

More research devoted to adults' attitudes toward and receptiveness to PBL assessment

could revolutionize the way in which high school equivalence programs operate considering "one of the primary reasons for an inability of ABE programs to enroll and retain non-completers is the perception that all such adults form a singular, monolithic population" (Martin, 1987, p.33). Learners in this population neither learn nor are motivated in the same way. Differentiation of instruction and assessment in adult high school equivalence programs demonstrate promise in attracting and retaining students based on its success in the k-12 and higher education settings.

Research Questions

RQ1: What is the estimated internal consistency, reliability, as measured by Cronbach's alpha and adjusted by Spearman-Brown of the APBLI?

RQ2: What is the internal factor structure validity of the APBLI?

Operational Definitions

Collaborative learning: "Collaboration is not a matter of division of tasks among learners, but involves mutual interaction and a shared understanding of the problem." (Dolmans, Grave, Wolfhagen, & Van Der Vleuten, 2005, p.733).

Constructive learning: "The constructive learning principle emphasizes that learning is an active process in which students actively construct or reconstruct their knowledge networks." (Dolmans, Grave, Wolfhagen, & Van Der Vleuten, 2005, p.732).

Contextual learning: "[Knowledge transfer] can be facilitated by anchoring learning in meaningful contexts, revisiting context at different times in rearranged contexts, for different purposes and from different perspectives" (Dolmans, Grave, Wolfhagen, & Van Der Vleuten, 2005, p.733).

Problem-based learning: “The problem is the focus for acquiring knowledge and fosters flexible thinking… The use of problems in PBL makes learning in PBL a constructive and contextual process” (Dolmans, Grave, Wolfhagen, & Van Der Vleuten, p.734, 2005).

Self-directed learning: “Self-directed learning implies that learners play an active role in planning, monitoring and evaluating the learning process” (Dolmans, Grave, Wolfhagen, & Van Der Vleuten, 2005, p.733).

Limitations

The APBLI will be administered only to adult high school equivalency students in Metro Detroit. Therefore its psychometric properties will be restricted to this sample, and caution is necessary before generalization to other populations.

CHAPTER 2: LITERATURE REVIEW

Central Features of PBL

Alt (2015) summarized PBL as "based on the constructivist theory, the PBL is a student-centered pedagogy in which students learn the course materials and encountering authentic problems. The need to develop problem-solving skills is recognized in this environment, as well as acquiring necessary knowledge and new information through self-directed learning. Learning takes place in small groups, guided or facilitated by a tutor, in contrast to the instructor role in the traditional lecture-based teaching" (p.52). Grave, Wolfhagen, & Van Der Vleuten (2005) stated PBL is a more effective pedagogical strategy to prepare college students because it uses "four modern insights into learning: constructive, self-directed, collaborative and contextual" (p.732). In order for PBL to work optimally, "three characteristics can be considered as essential: problems as a stimulus for learning, tutors as facilitators, and group work as stimulus for interaction" (Dolmans, Grave, Wolfhagen, & Van Der Vleuten, 2005, p.734).

In PBL, the problem is the driving force of the lesson. Students are posed with a complex problem that must be solved starting with their prior knowledge, which will lead their research to solve the problem. In PBL, tutors differ from teachers because the tutors are simply there for guidance and support as opposed to disseminating information. Tutors are not the delivers of content, but the content experts who ask essential questions to dig deeper into the content, possibly ask guiding questions to clear misconceptions, and make sure all participants are actively involved. In PBL team members depend on each other because the role of the tutor is diminished to a supporting role.

In order to do well in a PBL assessment based curriculum, a student must embrace: a constructivist learning style where the problem leads the student to construct meaning as opposed

to reading and regurgitating knowledge; a disposition of active learning and persistence where the teacher's role has been diminished to a tutor who is there for support as opposed to students blindly following a teacher's instructions; an insistence upon authenticity in learning and genuine curiosity where students learn what is relevant to their lives; and collaboration between team members considering the tutor takes a back seat in the educational environment and team members are expected to collaborate to solve the problem, which is not the same as simply delegating tasks.

Dimension 1: Authenticity in Learning & Genuine Curiosity

This dimension defines the disposition of students who have experience in independent learning conducted outside the academic setting and insist upon learning that is relevant in the real world. These students are intrinsically motivated, self-starters, and learn as a response to their curious nature (Rossing & Long, 1981). Because many adult students love learning but reject the formal education setting (Carragher & Golding, 2015), building an authentic curriculum that mimics learning they would naturally conduct on their own using trial and error as well as research through PBL might attract them to a degree conferring educational setting. Authenticity was defined as "the extent to which assessment tasks feature real-life situations that are relevant to the learners" (Waldrip, Fisher, & Dorman, 2009, p.121). Rossing and Long (1981) deemed curiosity as especially important for adults students engaging in guided learning projects. They defined curiosity as "an intrinsic form of motivation. In its pure form it occurs when no extrinsic reason for seeking learning or information is motivating the learner. Most accepted methods for measuring curiosity are based on measuring inquiry behavior or motivation in the absence of obvious extrinsic motivation" (Rossing & Long, 1981, p.26).

Davies (1981) noted in the context of adult learners "a different approach is one that starts with the perceptions, the lived experience, the being of the learner. Learning needs to develop out

of the current experience of the learner and build from it" (p.228). Burgess (1971) found the dimension "the desire to know for the sake of knowing" (p.9), synonymous to curiosity, ranked second of seven reasons adults participate in noncompulsory education, accounting for 12.4% of the variance. "The desire to reach a personal goal… to gain knowledge of skills in order to improve the individual's ability to serve his needs of a personal nature which are for his own gain" (p.9), synonymous to authenticity, ranked first, accounting for 15% of the variance. However, studies measuring the importance of curiosity in adult learning projects have produced mixed results. Carp, Peterson, and Roelfs (1974) and Tough (1969) found curiosity to be strong motivators for engaging in learning projects, while Miller (1964) and Robinson (1965) found learning for pure enjoyment to be weak motivators for adult learners.

Henry and Basile (1994) noted "one significant motive for participation, found in 64% of the 1984 NCES study as the single most important reason for enrollment, was to secure a new job or to advance in a job" (p.66). However, this is not the case for all adults who choose not to participate in formal educational settings. Porras-Hernandez and Salinas-Amescua (2012) conducted a study with "279 poorly educated mestizas and Native women in two regions of Mexico who were not participating in institutional programs" (p.331). These women had high self-perceptions and were not intimidated by school. Their reason for non-participation is simply that did not think school was relevant to them because they had found other means of survival without a formal education. However, 75% wished they had continued and had high opinions of school. With more choices that relate to their interests and curiosity, would-be students similar to these women might seek degree-conferring education.

Students who embrace authentic learning and the PBL framework will frequently question the utility of instruction that is inauthentic or irrelevant to their lives. When the utility of the

instruction is validated by the response “because this will be on your test”, this will cause these students to disengage or even drop out (Wilson, 1980). Greghan and Adair-Greghan (2015) added “there appears to be a disconnect between curriculum implementation and application of students’ learning within their daily lives. Faced with these pressures, many students are choosing not to continue their education and are dropping out of school” (p.2). However with the implementation of PBL, the learning is based on the students’ final project. Validating the relevance is more logical and easier for the students to internalize. For these students, if they are required to complete a task that involves strengthening fundamental core skills in order to complete the larger task it must have high task value, which are the “beliefs concerning students’ ratings about how interesting, useful, or important the course material is to them” (Pintrich, et al., 1993, p.808). Therefore, all learning objectives must be tied back to the project, which means it is more likely that the students will master those objectives if they can see the utility in it.

Students of this profile include students who seek alternative educational experiences. They include artists and social justice activists (Rothes et al., 2017), entrepreneurs (Martin, 1987), woodworkers (Carragher & Golding, 2015), those whose “major goal to be achieved through education is to contribute to the solution of ills in present day society – racism, poverty, pollution, segregation, or mental illness” (Burgess, 1971, p.3), or avid readers who are interested in learning (Deane, 1950), but not within the confines of a formal educational institution (Carragher & Golding, 2015). Learning is accomplished for enjoyment, and for their own edification, be it at their job or their personal lives (Beder & Valentine, 1990; Burgess 1971).

For students with the aforementioned characteristics, the education provided through conventional teaching is misaligned with their educational goals. For example, Beder and Valentine (1990) studied the factor Literacy Development which encompassed written and oral

communication skills. They found the phrase "'I need to be better at math' failed to load on this factor (or any other) at the criterion level; this lack of observed commonality represents a challenge to those who would 'lump' basic skills together, in that it suggests that the motivation to learn math is somewhat distinct from other motivations. Factor IV explained 4.6 percent of the total scale variance" (p.84). Students rejecting the notion that they have to learn certain material because it may or may not appear on their test supports how important it is "to give voice to learners, to allow them to teach us what they hope to achieve through literacy education. As such, it is more than a symbolic demonstration of respect for learners' rights of self-determination" (Beder & Valentine, 1990, p.80). Another study conducted by Hayes and Valentine (1989) which included 160 "learners functioning at or below the sixth-grade level" (p.1) to rate the utility of twenty functional tasks that were foundational in adult basic education. This is important because by adulthood, learners know what they want and need to learn for their individual life goals, which may or may not include the Pythagorean Theorem, photosynthesis, or an array of concepts emphasized in traditional education. As noted by Hayes and Valentine (1989) there was "a striking tendency for students to learn most of what they needed least and to learn least about what they needed most" (p.11) in the formal educational setting. Although the philosophy of education is to teach the skills of reading, writing, and arithmetic so that students can apply these skills in any context, Flaherty (1977) found students who do well on academic tasks do not necessarily perform well on functional tasks, and the opposite is true as well. Although these studies are decades old and the GED changes at least once a decade, there still exist a limited number of options for adult high school completion students that address these issues. Choice is of the utmost importance to these students. As Wolfe (1963) asserted "learning is purposeful when an individual selects and engages in those activities which will provide him with information and skills he desires" (p.26).

PBL students reject the passive nature of school (Carragher & Golding, 2015; Scanlan & Darkenwald, 1984). These are students who are more skeptical than children and more likely to reject of information that does not coincide with their previous knowledge (DiVesta, 1974; Machnik, 1975). Many of these students may be those who reject the Eurocentric standard of the education system which oppresses, misrepresents, or neglects other marginalized cultures (Shockley & Frederick, 2010; Thompson & Wallner, 2011). Another group represented in this demographic are those who simply find formal education boring and disengaging (Acee et al., 2010; Scanlan & Darkenwald, 1984). Other students experience test-taking anxiety (Duty, S., et al., 2016; Pintrich, et al., 1993) and general anxiety about the academic process (Rose, 1998). PBL relieves test-taking anxiety in many ways. First, the task in PBL is "well-defined and clear to the learner" (Waldrip et al., 2009, p.126) which is not true for the GED, HiSET or TASC. The aforementioned standardized tests might include any assortment of questions unbeknownst to the test taker while in PBL students choose the basis of their curriculum. Second, Waldrip et al. (2009) stated "students appreciated the extent to which their assessment tasks allowed them choice and allowed them to pursue approaches of interest as well as expand their capabilities" (p.126 – 127). Currently, the GED, HiSET and TASC do not give all test-takers an equal chance because they are geared toward those who thrive in a test taking situation as opposed to those who need choice, relevance, hands-on learning, and interaction in order to better demonstrate their competencies.

PBL learners are not motivated by grades, teacher praise, or social recognition (Tas & Tekkaya, 2010). Jang and Park (2006) stated students who choose to participate in PBL should be students who are rewarded by the experience of learning itself. They will tend to do better in a PBL environment than students who perform at the highest potential in order to receive an external reward, such as a good grade in the class. These students are deep learners (Furnham et al., 2011;

Rothes et al., 2017) who strive to master their goals (Tas & Tekkaya, 2010).

Carragher and Golding (2015) studied a group of men in Ireland who rejected learning in the form of an academic institution but engaged in self-directed education in a collective non-degree conferring, informal setting. Interactions and learning documented a phenomenon that transpired among men called learning sheds. One participant stated "you have so many knocks in life as you came along that you were taught by your knocks, you were taught by experience. If you walked along and you fell down that road you won't do it again… so far as school is concerned it never taught me very much at all. I left school at 14 and what I know now I learnt it along the road" (Carragher & Golding, 2015, p.160). This sentiment was common among this community. "The men consulted for this research did not generally view school and its outcomes for them in a positive light. Most had left school early and continued to harbor negative attitudes toward education and learning in formal educational settings despite the intervening years" (Carragher & Golding, 2015, p.161). Carragher and Golding (2015) found these men thrived in a hands-on learning environment where their interests were taken into consideration and the knowledge they acquired was practical rather than theoretical in nature. The men were not motivated by grades, teacher praise, or social recognition. They were intrinsically motivated by their interests and natural curiosity. The "older men were motivated to participate in learning in men's sheds by a need for stimulation through taking part in meaningful activities and a need for peer support. This was expressed as a need 'to get out of the house' (95%), 'to be with other men' (95%), and a preference for 'hands-on learning' (71%) as opposed to a preference for 'learning in classroom situations' (29%)" (Carragher & Golding, 2015, p.159). Ninety-eight percent of respondents stated they enjoyed learning sheds because they are doing what they enjoyed, and 91% liked that they had a say in how the shed was run. Those statistics are in contrast to only "19% of respondents

having attended a formal learning program in the past year, and just one in three (33%) reporting a positive education experience of school" (Carragher & Golding, 2015, p.160)

Students who embrace authentic learning and genuine curiosity outside of the confines of the classroom might want to attain a high school diploma for personal reasons such as to set a good example for their family and friends, and help their children with their homework (Burgess, 1971; Beder & Valentine, 1990). However, they are not willing to enroll in school at the expense of their educational autonomy (Rothes et al., 2017; Wilson, 1980). These students also described themselves as rebellious, comfortable with disorder, less obliging, and risk takers (Wilson, 1980). They are likely to embrace PBL because "unlike a traditional classroom that might have practice problems that follow a lecture, PBL classrooms are places where communication skills, prior knowledge, metacognitive skills, lifelong learning skills, and content knowledge are practiced by focusing on problems prior to or, more often, in lieu of explicit instruction" (Schettino, 2016, p.6). Therefore adult high school completion students with extensive real-world experience will continue to explore their natural problem solving nature and earn a high school diploma concurrently.

Time is also an important consideration when a student decides whether to engage in a PBL curriculum. Because the role of the teacher is simply a facilitator and guide (Lam, D., 2004), or a tutor (Savery, 2006), the students are the drivers of the educational experience considering PBL is a student-focused learning endeavor (Savery, 2006). Thus setting a time table and sticking to it is essential to meet the final goal. As Poell et al. (1998) stated "the participants in the project must recognize the necessity of investing time and effort in the project and they must be prepared to do so; they should also be able to supervise and steer their own learning process" (p.41). Students must also recognized "projects often take longer than anticipated" (Thomas, 2000) and

have time to be patient with the process.

In terms of preferred assessment style, Furnham et al. (2011) conducted a study in which they analyzed the correlation between students preferred assessment style (multiple choice, essay, final year dissertation, oral exam, continuous assessment, group work) and personality traits (surface learning, deep learning, achieving learning, neuroticism, extraversion, openness, agreeableness, conscientiousness, and intelligence). They found "those with lower Deep, but higher Surface approaches and lower Openness scores tended to favour MCQ (multiple choice questions) for assessment. The opposite pattern was true for assessment by essays: Higher Deep, lower Surface and higher Openness scores predicted preference for essays" (Furnham et al., 2011 p.261). Students who are deep learners and want to express their own ideas fully are being forced into assessments, such as the GED, TASC, and HiSET, which are misaligned with their strengths as learners. PBL would give these students an option that meets their needs as a learner.

Furnham et al. (2011) questioned the extensive use of MCQ assessments considering "it is particularly interesting that bright, but less imaginative Surface learners preferred multiple choice exams which can differ considerably in terms of whether they primarily involve memory for facts or subtle understanding of complex issues. These exams are used extensively in some countries (i.e. the USA) and rarely in others (i.e. the UK) and are favoured by lecturers for their ease of administration and reliability of marking" (Furnham et al., 2011 p.261 - 262). It was also found "intelligence adds very little (almost nothing) as a predictor of assessment choice when considered along with Approaches to Learning and personality" (Furnham et al., 2011 p.261). This revealed an intelligent student could favor group work, a component of PBL (Savery, 2006) and display their intelligence using PBL. However, that same student might not be able to demonstrate intelligence on a MCQ exam or choose to not enroll in school at all because the education system

could be viewed as not meeting the needs of the learner. PBL is intended for the "learning styles of students who were characterized by their teachers as 'pleasant surprises' (students who perform poorly in conventional classrooms, but who do well in PBL activities)" (Thomas, 2000, p.20).

PBL would meet the educational needs of students who are naturally curious and tolerate the ambiguity of the PBL process because they as the student are the drivers of the educational experience, while their teachers act as guides who would set the guidelines for what meets the standards of a high school equivalence diploma. Therefore the dimension "Authenticity in Learning and Genuine Curiosity" demonstrates strong relevance in predicting which students would fare well in the PBL setting.

Dimension 2: Collaboration

Collaboration is frequently cited as a central component of PBL (Bédard et al., 2012; Carragher & Golding, 2015; Dolmans, Grave, Wolfhagen, & Van Der Vleuten, 2005; Jang & Park, 2016; Saver, 2006; Riberio, 2011; Schettino, 2016; Walker, & Leary, 2009; Wrigley, 1998). Savery (2006) stated "collaboration is essential" (p.13). Collaboration in the context of PBL would be characterized as an environment where "student learning and context materials are (co-)constructed by students and teachers through mostly contextually based problems in a discussion-based classroom where student voice, experience, and prior knowledge are valued in a nonhierarchical environment utilizing a relationship pedagogy" (Schettino, 2016, p.2). Using the assessment technique of PBL, students must work collaboratively on a team to complete the final project. A key word was "nonhierarchical". In order to successfully participate in PBL, students must embrace the idea of influence without authority. When problems arise, they have to be able to compromise and negotiate. They also must be open to new ideas, perspectives, self-assessment, and peer assessment (Savery, 2006).

The spirit of collaboration is essential because the teacher's role is diminished to that of a facilitator and guide (Lam, D., 2004), also referred to as a tutor (Savery, 2006). The students must embrace the idea that the teacher's role is not to referee for every small squabble and "get away from the concept of authority being held by one person who is the sole leader" (Schettino, 2016, p.4). The teacher is one of many resources available to the students. Thus within PBL, students should consult their peers, trusted internet searches, library research, and knowledge from experts in the field (Ribeiro, 2011; Remijan, 2016). A student who displays too much dependence on the teacher goes against the principles of collaboration. This would be an indication that this student is not a candidate with high potential for success in PBL.

In Bédard et al. (2012), the participants were 480 undergraduate students from the Electrical Engineering Program, Computer Engineering Program, and School of Medicine at the Université de Sherbrooke, Canada in the PBL programs. Based on the sample of medical students, electrical engineering students, and computer engineering students, supports-stress was the greatest determinant for two other central component of PBL: students' engagement and persistence. Supports-stress was defined as "when students perceive the curriculum (their learning environment) as a contributing element that diminishes their stress, they are much more likely to engage in the learning activities fully" (Bédard et al., 2012, p.22). In terms of stress, Bédard et al. (2012) noted "another aspect that was mentioned as contributing to stress reduction is peer support" (p.25). Considering that collaboration is a key aspects of PBL, it stands to reason that an openness to collaboration is also a key characteristic of those who would excel in PBL. In fact, "one of the most striking characteristics of [PmBL and PtBL] curricula is the importance allocated to group work. Whether it be during PmBL sessions or while working on engineering projects, students are now, more than ever, expected to collaborate and cooperate with their peers" (Bédard

et al., 2012, p.25). Thus a student who views group work as a source of inspiration and support rather than a source of frustration shows potential to succeed in a PBL curriculum.

To gauge the degree to which students possessed an openness to collaboration, Jang and Park (2016) measured medical students' personality traits using "student data from a Korean version of the Temperament and Character Inventory-Revised Short (TCI-RS)" (p.1367). Collaboration was measured because it was cited as a critical personality trait in the medical field. Specific to collaboration, "in this study, 4 elements of collaborative learning in PBL were examined: participation in group discussions, preparedness for group work, communication, and contribution to the group work. Both the correlation and regression analyses indicated that participation in group discussions was positively related to a temperament dimension of patience. That is, students who tended to persevere in a challenging learning context were more likely to actively participate in group discussions. Students with high persistence are often ambitious. Thus, they could be proactive in participating in learning activities" (Jang & Park, 2016, p.1369). Through this study, it is revealed that students who are patient with the collaborative nature of PBL show the greatest potential for success in this curriculum.

There was no statistically significant difference in academic achievement between the students that participated in PBL in Jang and Park (2016) in comparison with students who participated in conventional education. This demonstrated that PBL was neither better nor worse than conventional education for this sample. However if a student chooses to participate in PBL, they must possess an openness to collaboration. As Jang and Park (2006) stated, "collaborative learning is a crucial element of PBL. The success of PBL depends on how well individual students work together toward common goals and build a shared understanding of knowledge" (p.1368).

PBL in the adult high school completion population shows potential considering there

exists a population of adult learners who engage in noncompulsory education for the sake of being a part of a social activity, and the objective of the learning activity is secondary to this primary goal of "companionship, fellowship, feeling of belonging, approval of others, or positive association with others" (Burgess, 1971). The appeal of a low-stress, collaborative learning PBL environment could draw students into the world of academia who otherwise would not. However, there also exists a population of students who would prefer to study and function alone (Burgess, 1971). This is to be expected considering PBL is not for every student. As Jang and Park (2016) explained, if "many students are still accustomed to teacher-centered, lecture-style classes, they may have had difficulty in adapting to a new way of learning (PBL) that requires effective collaboration and communication with peer students regardless of their academic achievement" (p.1370). PBL could be offered as another option for high school completion. Although a disposition to study independently does not necessarily disqualify a student from thriving in a PBL environment (Mergendoller, J., Maxwell, N., Bellisimo, Y., 2006), the evidence suggests that a student willing to collaborate with peers will more likely benefit academically from the collaborative PBL environment.

CHAPTER 3: METHODOLOGY

The purpose of this study is to develop a reliable and valid instrument to predict adult non-high school degree holders who would perform well academically in a project-based learning (PBL) assessment environment to obtain their high school diploma as opposed to traditional standardized tests such as the *General Educational Development* (GED), Test *Assessing Secondary Completion* (TASC), and *High School Equivalency Test* (HiSET). This study will modify the Waldrip et al. (2014) instrument which measured student perceptions of personalizing learning with a sample of students aged 7-10 in secondary schools in Australia. They found the following dimensions relevant to their instrument: "Self-Directed Learning (including self-management, desire for learning and self-control), Teacher Support, Personal Relevance, Shared Control, Student Engagement (emotional, cognitive, behavioural), Congruent with Planned Learning, Authenticity, Student Consultation, Transparency, Academic Efficacy, Peer relationships, Self-Report on Disruptive Behaviour, Individualisation and Opportunity for Personal and Social Development" (Waldrip et al., 2014, p.361-362). For the purposes of the initial investigation, two dimensions will be assumed based on this literature review: (1) Authenticity in learning and genuine curiosity; (2) Collaboration.

Design

An intuitive-rational approach (Waldrip et al., 2014) will be used to determine which dimensions of student characteristics are pertinent to success in PBL. It requires three steps: "(1) identification of salient dimensions, (2) writing sets of test items that are linked conceptually with each salient dimension and (3) field testing the questionnaire. Identifying salient dimensions usually involves a review of literature and utilizes the researchers' academic expertise. Writing test items utilizes the subjective opinions of researchers with scale-development knowledge" (p.359). Waldrip et al. (2014) suggested an extensive literature review of at least "50 policy and

research papers on personalized or individualized learning practices, characteristics, principles, and techniques. It included examining aspects of self-regulated learning" (p.359).

Development of the Instrument

The content of the APBLI will be established through the literature review of central characteristics of students who succeed academically in a PBL assessment curriculum. Thirty three questions pertain to the dimension "authenticity in learning & genuine curiosity" and nine questions pertain to the dimension "collaboration". The dimension "authenticity in learning & genuine curiosity" contain more questions because it measures students' ability to learn independently within the context of an academic setting, as well as ways in which they have displayed their ability to demonstrate learning outside the context of an academic setting. Further the content validity will be established by consulting with five educators with at least five years of classroom experience to assure that the Lexile and syntax are appropriate for non-high school degree holders to a reading level as low as second grade.

Demographics information will be collected by following the United States Census Bureau (2017) form, but will be revised to be listed in alphabetical order. Demographics are included in this study because it was collected in the Waldrip et al. (2014) study. Ethnic demographics are also pertinent to this study because in a city such as Detroit where the majority of the population is African-American, giving students the choice to direct their studies in the context of their cultural heritage is a growing trend in best practices in education (Shockley & Frederick, 2010; Thompson & Wallner, 2011). Neither the GED, HiSET, nor TASC are centered on culture. Information on age will also be collected. Age demographics are pertinent to this study because as Carragher and Golding demonstrated (2015), self-directed learning appealed to students as old as senior citizens.

The APBLI is a five-point Likert scale with a range from strongly disagree to strongly

agree. For the data analysis, the choices will be assigned numbers: 1 for strongly disagree; 2 for disagree; 3 for neutral; 4 for agree; 5 for strongly agree. Quantifying the responses will allow for measurements of mean, variance, and tests such as Bartlett's Test of Sphericity, Cronbach's Alpha, and Spearman-Brown. Thirteen questions are reverse scaled that ask students about attributes that go against the conceptual foundation of PBL. This is noted by the researcher in order to conduct the data analysis by rescoring these questions.

Psychometrics

The reliability of the instrument will be determined using Cronbach's alpha for the complete scale, and Spearman-Brown adjustments for the subscales. Reliability estimates will be computed after the factor analysis. Exploratory factor analysis with Varimax rotation with principal component extraction "to assist with scale refinement" (Waldrip et al., 2014, p.359) will be used to determine the internal factor structure. According to Hair et al. (2010) there are three ways to test the assumptions of factor analysis. "A strong conceptual foundation needs to support the assumption that a structure does exist before the factor analysis is performed. A statistically significant Bartlett's test of sphericity (sig < .05) indicates that sufficient correlations exist among the variables to proceed. Measure of sampling adequacy (MSA) values must exceed .50 for both the overall test and each individual variable; variables with values less than .50 should be omitted from the factor analysis one at a time, with the smallest one being omitted each time" (p.105). The conceptual foundations have been established through the literature review. Bartlett's test of sphericity and the measure of sampling adequacy will be completed within the SPSS Version 25 after being downloaded from Qualtrics, the data gathering website that will be used for this study.

The initial factor loadings will be based on Kaiser normalization with eigenvalues set to 1.0 and visual inspection based on a scree plot. Subsequently, an iterative approach will be

conducted by sorting the factor loadings, and suppressing those lower than |.4|. In this second approach, items will be deleted that either fail to load, or load on multiple factors.

Age will be analyzed by finding the mean average of the instrument responses and finding the Pearson's correlation of the variables age and mean response to instrument. Demographics will be analyzed by creating a relative frequency table and graph of the mean average of the instrument responses and the self-identified ethnicity of the participant.

Research Questions

RQ1: What is the internal factor validity of the APBLI?

RQ2: What is the estimated internal consistency, reliability, as measured by Cronbach's alpha and adjusted by Spearman-Brown of the APBLI?

Participants and Setting

The participants will be selected using convenience sampling from two adult high school completion schools in Detroit, Michigan during the 2017 – 2018 academic year. Participants in this study are enrolled in either the GED program or the high school completion program. The age of the participants is expected to span from 18 to 65. The two participating schools were chosen for convenience, because the researcher is employed by the school system. The sample size needs to be at least 100 because "Warner (2013) recommends that the number (N) be no less than 100 and states that it is desirable to have $N > 10p$ where p equals the number of domains" (Warner, 2013 cited in Huddleston, 2014, p.51).

IRB

An Institutional Review Board (IRB) approval will be received before research is conducted. In alignment with the IRB process, potential risks will be disclosed to the participants and signed consent will be received from all participants. Permission will be requested from the

school district through the Office of Research, Evaluation, Assessment & Accountability, the school superintendent, and the school administrators. Participants will be recruited through an email to the school administrators to ask for students who are interested in participating in educational research. The researcher will request the school district to allow usage of the school computers after school.

Research protocol

The APBLI will be administered online using Qualtrics and exported to SPSS Version 25 for statistical analysis, which is an export option according to the Qualtrics website (2017). Instead of the participants writing their names, they will each have a unique student ID no. which will be the participant's birthdate in the form of the two digits for the birth month, two digits for day of the month, and the last four digits of the participant's phone number. During the administration of the APBLI, instructions will be delivered orally to students as students read along silently. The students will complete the instrument twice, once for the students' strongest content area, the second time for the students' weakest content area. The choices are: English, social studies, math, and science. Students will complete the instrument twice because as Knowles (1998) noted "the assumption that all adults have full capacity for self-teaching and personal autonomy in every learning situation is generally not accepted. Any particular learner in a particular learning situation is likely to exhibit different capacities and preferences" (p.136). For example, a student might love literature but despise math. A student might be open to the idea of PBL within the context of English but need more structure and teacher assistance in a mathematics course. If students do not complete this survey twice with a context in mind for each administration, this might confound the results. Students will be able to choose which content area they perceive to be their strongest and their weakest area. However, if students are not sure the researcher will analyze their entry GAIN

test scores to tell the participants which content area is strongest and which is weakest.

Each administration of the instrument will take approximately 10 minutes to complete for a total of 25 minutes which will include reading the instructions and writing the identifying information. Each administration of the instrument will be conducted in groups of 20 or less students based on the lab's capacity and the ability of the researcher to assist students with technical issues. Students will be given a slip of paper to access the web address for access to the APBLI. Results will be shared with the school district and made available to all participants regarding the instruments reliability and validity in aggregate form.

CHAPTER 4: DATA ANALYSIS AND PRESENTATION OF FINDINGS

In the state of Michigan there are three ways adults who are 18 years or older can receive their high school equivalence diploma: *General Educational Development* (GED); *Test Assessing Secondary Completion* (TASC); and *High School Equivalency Test* (HiSET). These three methods are standardized tests. It has been argued that standardized tests do not suit all learning styles (Gardner, 2006), therefore they are not an appropriate measure of high school equivalence for all students. A best practice in education is project-based learning (PBL). PBL is used in many academic fields including elementary, and high schools (Slavin, 1990), higher education (Dolmans et. al, 2005), and most notably in medical schools (Jang & Park, 2016). However, there is no such option for adults to receive their high school equivalence diploma. The purpose of this study was to develop a Likert scaled instrument, called the *Adult High School Completion Project-Based Learning Instrument* (APBLI), and determine its reliability and predictive validity. This instrument will be useful for determining which adult high school equivalency students will likely succeed using a PBL curriculum based on the personality factors and learning style that are necessary for success in a PBL environment.

Proper steps were taken to receive permission from the participating institution, Detroit Public Schools Community District, and to complete the IRB process through Wayne State University. By the end of the data collection period, the number of participants was 34. However, two participants did not complete the instrument and skipped certain questions. Demographic information was collected from the participants during the survey. Table 1 is a display of the students' demographic choices during the administration of the survey. The results are displayed in Table 2. Note participants had the option of choosing more than one category and the total is greater than 34.

Table 1

Race Codes

Variable Code	Race/Ethnicity
Q1D4_1	American Indian or Alaska Native – A person having origins in any of the original peoples of North and South America (including Central America) and who maintains tribal affiliation or community attachment.
Q1D4_2	Asian – A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.
Q1D4_3	Black or African American – A person having origins in any of the Black racial groups of Africa.
Q1D4_4	Native Hawaiian or Other Pacific Islander – A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
Q1D4_5	White – A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.
Q1D4_6	Other
Q1D4_7	I choose not to answer

Table 2

Frequency of Race

		QID4_1	QID4_2	QID4_3	QID4_4	QID4_5	QID4_6	QID4_7
N	Valid	1	0	28	0	5	2	2
	Missing	33	34	6	34	29	32	32

As shown in Table 3, the students' age ranges was also collected during the administration of the instrument. Due to the limited number of participants in the age ranges of 29 - 38, 49 – 58, and 59 or older, greater variation of ages would be necessary before analyzing the data based on age and race.

Table 3

Frequency of Ages

	Age Range	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 28	19	55.9	57.6	57.6
	29 - 38	3	8.8	9.1	66.7
	39 - 48	7	20.6	21.2	87.9
	49 - 58	3	8.8	9.1	97.0
	59 or older	1	2.9	3.0	100.0
	Total	33	97.1	100.0	
	Missing	1	2.9		
	Total	34	100.0		

A Kaiser-Meyer Olkin Measure of Sampling Adequacy (KMO) and a Bartlett's Test of Sphericity (BTS) were conducted. BTS is useful when comparing the variances of the two samples using the same instrument or the repeated measurements of one sample. Participants of this study took the instrument twice: first, thinking about their strongest subject area; second, thinking about their weakest subject area. The KMO and BTS outputs stated "this matrix is not positive definite," which means "if there are more variables in the analysis than there are cases, then the correlation matrix will have linear dependencies and be NPD (nonpositive definite). Remember that FACTOR uses listwise deletion of cases with missing data by default. If there were more cases in the file than variables in the analysis, but also many missing values, listwise deletion could result in more variables than retained cases" (IBM Support, 2018). Thus, the warning message was produced because the data set had N = 34 participants, but 37 questions on the scale for each administration.

Consequently, the factor analysis was conducted before the KMO and BTS. All the variables (instrument questions) were loaded from the participants' administration of the survey considering their strongest subject area. The principal analysis extraction method was principal

components, extracted based on Eigenvalues greater than 1. The factor analysis was conducted with Varimax rotation. Coefficients with an absolute value less than 0.4 were suppressed. On the output's component matrix, those variables that loaded onto more than one component were deleted. These steps were repeated until the following variables displayed in Table 4 remained. There were six components total. In this study, components are referred to as factors.

Table 4

Original Rotated Component Matrix

Question	Component (Factor)					
	1	2	3	4	5	6
Q14_r	-.843					
Q27	.750					
Q23	.722					
Q6_r	-.585					
Q5		.812				
Q21		.786				
Q18		.735				
Q7_r			-.847			
Q28			.791			
Q38			.745			
Q30				.866		
Q31_r				.854		
Q3_r					.768	
Q15_r					-.736	
Q2_r					.573	
Q19_r						.886

Some questions in the instrument were designed to be reverse scored (denoted with "_r"). For example, question 14 read "in my strongest/favorite subject area, the most important learning comes from assignments that my teacher is going to collect and assign a letter grade (i.e. A, B, C, D, F) for class credit". Tas and Tekkaya (2010) wrote students who do well in PBL curricula are

more motivated to do well based on intrinsic motivation as opposed to grades, teacher praise, or social recognition. It was assumed that question 14 would assess a student's extrinsic motivation and therefore was reverse scored (denoted with Q14_r) because it is not in alignment with the PBL characteristic of intrinsic motivation. However, that is not what was discovered through the rotated component matrix because the value for the reversed question 14 was negative. It could be possible that question 14 measured a student's work ethic as opposed to their source of motivation (intrinsic or extrinsic). Further investigation would be required to answer this question. Questions that loaded negatively were reversed back to produce the final rotated component matrix as displayed in Table 5.

Table 5

Final Rotated Component Matrix

Question	Component (Factor)					
	1	2	3	4	5	6
Q14	.843					
Q27	.750					
Q23	.722					
Q6	.585					
Q5		.812				
Q21		.786				
Q18		.735				
Q7			.847			
Q28			.791			
Q38			.745			
Q30				.866		
Q31_r				.854		
Q3_r					.768	
Q15					.736	
Q2_r					.573	
Q19_r						.886

It is questionable that question 6, which states “in my strongest/favorite subject area, what I learn in school is important whether I can use that information daily or not”, remained in the instrument after the factor analysis as well as question 15, which states “in my strongest/favorite subject area, I believe learning something in class that will not be on my test is a waste of time”. It is possible that referencing a test confounded the students’ interpretation of the question. That is to say, if students are required to take a test they only want to learn what will be on the test. However, in general students enjoy learning for the sake of learning. Further investigation would be required to settle the contradiction of these two questions. The questions that remained after the factor analysis were used as the final APBLI. These questions are detailed in Table 6. These same questions served as the instrument for students’ strongest and weakest subject area.

Table 6

Final Adult Project Based-Learning Instrument

Factor 1	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
Q14 In my strongest/favorite subject area, the most important learning comes from assignments that my teacher is going to collect and assign a letter grade (i.e. A, B, C, D, F) for class credit.					
Q27 I enjoy questions where there is more than one possible correct answer in my strongest/favorite subject area.					
Q23 I enjoy conducting					

experiments outside of school about my strongest/favorite subject area. (For example: renovating a house, building a shed, starting a new business, etc.) Q6 In my strongest/favorite subject area, what I learn in school is important whether I can use that information daily or not.					
Factor 2	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
Q5 In my strongest/favorite subject area, I prefer learning material that I can use in real life. Q21 I enjoy reading books and articles (online or in print) about topics that interest me in my strongest/favorite subject area. Q18 In my strongest/favorite subject area, I have ideas I would like to research independently for degree credit.					

Factor 3	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
Q7 In my strongest/favorite subject area, I prefer learning a small amount about many topics.					
Q28 I enjoy learning that is based on my cultural heritage in my strongest/favorite subject area.					
Q38 I learn more working on a group project that working alone in my strongest/favorite subject area.					

Factor 4	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
Q30 I work well on group projects in my strongest/favorite subject area.					
Q31_r I hate working on group projects in my strongest/favorite subject area.					

Factor 5	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
Q3_r In my strongest/favorite subject area, I prefer to learn by completing paper-and-pencil assignments.					

Q15 In my strongest/favorite subject area, I believe learning something in class that will not be on my test is a waste of time.	
Q2_r In my strongest/favorite subject area, I would rather take the GED test than complete a project.	

The questions in F1 (factor 1) that remained in the APBLI is summarized as the students' desire for feedback and quantification of the learning experience (as measured by grades), as well as the strength of their work ethic in an academic setting. Therefore the title of F1 is Academic Work Ethic. The questions in F2 is summarized as students' need for transferability of learning in the academic setting to the real world. Therefore the title of F2 is Authenticity in Learning. The questions in F3 is summarized as the need for students to have a diverse, culturally relevant learning experience. Therefore the title of F3 is Diversity in Learning. The questions in F4 clearly reflect students' ability to work well with their peers. Therefore the title of F4 is Collaboration. The question in F5 is summarized as the students' need to have hands-on learning experiences, the hallmark of PBL. Therefore the title of F5 is Hands-On Learning.

As previously stated, the Kaiser-Meyer Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity (BTS) were conducted after the factor analysis. The output for the KMO was 0.166. This indicates that conducting a principal component factor analysis is not appropriate for this data set. This is possibly because the sample size was too small. The null hypothesis for BTS is that the correlation matrix is an identity matrix. That means that every factors

correlates to itself perfectly and the factors have zero correlation to any other factors. In this case, there would be no possibility for factor analysis. For this study, the BTS approximate chi-square reading was 684.125, the degrees of freedom was 435, and the results were statistically significant ($p < 0.0001$). The null hypothesis was rejected and the alternative hypothesis was retained. The correlation matrix of the factors was not an identity matrix and there was some collinearity between factors. In summary, there is collinearity between the factors, but not enough to necessitate a factor analysis. This instrument includes the necessary amount of factors and questions to measure which students would be potential candidates for PBL.

The correlation between how likely a student is to prefer PBL in their strongest area and their weakest area was also calculated and is displayed in Table 7. The correlations were calculated by comparing each student's average subscale factor score in the strongest area to the same factor in the student's weakest area. Because the KMO and BTS had already been conducted, the corresponding factor of the two administrations could be compared.

Table 7

Pearson Correlation Weak Area and Strong Area on the Same Factor

Factors	Correlation	2-tailed significance level	N
Factor 1 Strong Area to Factor 1 Weak Area	0.528	0.001	34
Factor 2 Strong Area to Factor 2 Weak Area	0.421	0.007	33
Factor 3 Strong Area to Factor 3 Weak Area	0.608	0.000	32
Factor 4 Strong Area to Factor 4 Weak Area	0.384	0.012	34
Factor 5 Strong Area to Factor 5 Weak Area	0.513	0.001	33

In all cases, there is a weak positive correlation between students' scores on the subscale for their self-reported strongest area and students' scores on the subscale for their self-reported weakest area. The results were statistically significant. That is to say, a student whose subscale score indicates a propensity to do well in one aspect (or factor) of PBL for their strongest subject

area, the chances that their subscale score will indicate the same propensity to do well on that same factor for their weakest area is not zero or a negative correlation, but it is also not very high.

The reliability of the APBLI was determined using Cronbach's alpha. Because the Cronbach's alpha was less than 0.70 for the entire instrument in both the students' strongest and weakest areas, the reliability of each subscale factor was calculated. Spearman-Brown (SB) was used as another measurement of reliability because it corrects for the low number of items. Spearman-Brown measures the reliability of each factor as if there were 23 questions of the same quality as the original questions for each factor instead of only 2, 3, or 4 questions. In the final rotated component matrix, question 19 loaded as its own factor. Instead of using question 19 as a factor on its own, it was included into factor 2 and then in factor 3. The results of Cronbach's alpha and Spearman-Brown for the participants' strongest area is displayed in Table 8. The results of Cronbach's alpha and Spearman-Brown for the participants' weakest area is displayed in Table 9. All factors except factor 5 in the weakest area had sufficient reliability measurements according to Spearman-Brown.

Table 8

Initial Reliability Table of Students' Strong Area

Scale/Factor	N	CA	SB
Total	23	0.489	n/a
F1	4	0.713	0.922
F2 w/ Q19	4	0.543	0.849
F2 w/o Q19	3	0.634	0.92
F3 w/ Q19	4	0.617	0.884
F3 w/o Q19	3	0.704	0.941
F4	2	0.747	0.969
F5	3	0.622	0.916

Table 9

Initial Reliability Table of Students' Weak Area

Scale/Factor	N	CA	SB
Total	23	0.620	n/a
F1	4	0.579	0.867
F2 w/ Q57	4	0.399	0.759
F2 w/o Q57	3	0.456	0.848
F3 w/ Q57	4	0.431	0.783
F3 w/o Q57	3	0.375	0.800
F4	2	0.540	0.925
F5	3	0.032	0.181

In both cases, Cronbach's alpha was greater without the inclusion of question 19. Question 19 in the strongest area administration of the survey translates to question 57 in the weakest area administration. Therefore, question 19 and question 57 were omitted from the APBLI. The results of Cronbach's alpha and Spearman-Brown for the participants' strongest area without question 19 is displayed in Table 10. The results of Cronbach's alpha and Spearman-Brown for the participants' weakest area without question 57 is displayed in Table 11.

Table 10

Final Reliability Table of Students' Strong Area

Scale/Factor	N	CA	SB
Instrument	23	0.489	n/a
F1	4	0.713	0.922
F2	3	0.634	0.92
F3	3	0.704	0.941
F4	2	0.747	0.969
F5	3	0.622	0.916

Table 11

Final Reliability Table of Students' Weak Area

Scale/Factor	N	CA	SB
Instrument	23	0.620	n/a
F1	4	0.579	0.867
F2	3	0.456	0.848
F3	3	0.375	0.800
F4	2	0.540	0.925
F5	3	0.032	0.181

The mean of each student's factor scale score was calculated. Any mean average above 3 indicated a propensity to do well in that factor (or aspect) of PBL. Any mean score below 3 indicated a propensity to not do well in that factor of PBL. The results of students' averages in their strongest area by factor are displayed in Table 12. The results of students' mean in their weakest area by factor are displayed in Table 13.

Table 12

Averages of Strong Factor by Student

QID1	Strong Factor 1 Mean	Strong Factor 2 Mean	Strong Factor 3 Mean	Strong Factor 4 Mean	Strong Factor 5 Mean
0121-9733	4.50	4.67	5.00	3.00	2.33
0129-5272	4.50	3.00	1.67	3.00	1.00
0203-1849	5.00	5.00	5.00	5.00	1.00
0219-4841	4.00	2.67	3.33	5.00	1.67
0221-9443	3.25	1.67	3.33	4.00	2.00
0301-5833	3.25	4.67	2.67	4.00	3.67
0417-2356	5.00	4.67	5.00	2.00	3.33
0502-4210	4.75	4.33	3.67	5.00	2.33
0507-3973	3.25	4.33	3.67	4.50	2.00
0528-4806	4.00	3.67	4.00	5.00	3.67
06-06-9082	4.25	5.00	2.33	2.00	1.33
0604-5075	4.50	3.00	3.00	3.00	2.00

0620-7419	4.75	4.67	3.67	3.50	1.67
0624-7413	4.25	4.67	2.00	5.00	2.33
0625-9044	3.75	3.67	3.67	4.00	2.00
0708-1589	4.25	4.67	2.33	3.50	2.67
0807-2297	4.75	3.33	5.00	5.00	1.33
0812-1530	4.00	3.67	4.00	4.50	1.67
0910-9389	4.00	4.00	4.00	3.00	2.67
0930-4758	2.75	4.33	4.33	5.00	2.33
1017-2766	4.00	3.67	4.00	4.50	1.00
1028-6657	4.00	4.33	2.67	5.00	2.67
1029-3090	4.00	4.00	3.67	4.00	1.33
1122-0094	4.75	4.00	4.33	3.00	1.67
1202-7635	5.00	4.67	5.00	3.00	1.33
1204-2823	4.25	4.67	2.67	3.50	3.00
1213-4512	5.00	5.00	1.33	5.00	1.00
1215-1410	4.75	3.33	4.00	4.00	1.33
1223-1173	3.50	3.67	3.00	3.00	3.00
12298760	3.75	4.67	4.00	3.50	2.67
Anon 1	4.25	4.67	3.00	4.00	2.67
Anon 2	2.00	4.33	3.00	2.50	2.67
Anon 3	3.25	4.00	3.33	4.00	1.67
Anon 8	5.00	4.00	4.33	3.50	1.00

Note: QID1 = student id

Table 13

Averages of Weak Factor by Student

QID1	Weak Factor 1 Mean	Weak Factor 2 Mean	Weak Factor 3 Mean	Weak Factor 4 Mean	Weak Factor 5 Mean
0121-9733	4.50	4.33	4.33	4.00	2.67
0129-5272	3.50	2.33	2.33	2.00	1.00
0203-1849	4.75	5.00	3.67	5.00	1.00
0219-4841	3.50	3.67	3.00	3.00	4.00
0221-9443	3.50	2.33	3.33	4.00	2.00
0301-5833	3.25	3.33	3.33	3.50	3.33
0417-2356	4.50	4.33	3.00	1.00	3.33
0502-4210	4.50	4.33	3.00	4.00	3.00

0507-3973	3.00	3.67	3.33	3.50	1.67
0528-4806	4.00	4.33	4.33	5.00	3.67
06-06-9082	2.50	2.33	4.00	2.50	2.00
0604-5075	4.00	4.00	3.33	2.50	3.67
0620-7419	4.75	4.67	4.00	4.00	1.33
0624-7413	4.00	3.67	3.00	5.00	3.00
0625-9044	3.25	3.33	3.00	4.00	2.33
0708-1589	4.00	3.67	3.33	5.00	2.67
0807-2297	5.00	4.67	5.00	1.50	1.00
0812-1530	3.50	3.33	3.33	5.00	2.67
0910-9389	5.00	5.00	5.00	3.00	2.33
0930-4758	3.75	3.67	3.67	3.50	2.67
1017-2766	2.75	3.33	3.50	3.00	2.67
1028-6657	3.75	4.00	1.67	4.00	2.67
1029-3090	3.50	3.67	3.67	3.00	2.33
1122-0094	4.75	4.33	4.33	4.00	2.67
1202-7635	5.00	4.67	5.00	3.00	2.67
1204-2823	3.25	3.33	1.67	1.00	3.00
1213-4512	4.00	5.00	2.33	2.50	3.33
1215-1410	3.50	3.33	3.33	3.00	2.33
1223-1173	3.00	3.00	3.00	3.50	3.00
12298760	3.00	4.00	3.00	3.00	3.00
Anon 1	3.50	3.67	2.67	2.00	2.67
Anon 2	3.75	4.33	3.00	3.00	3.00
Anon 3	3.75	3.33	3.00	4.00	1.67
Anon 8	5.00	3.67	4.33	3.50	2.33

Note: QID1 = student id

The mean of the strongest and weakest factors as an aggregate was also calculated and are displayed in Table 14. Thirty students scored an average at or above 3.0 in their strongest/favorite subject area. Thirty students scored an average at or above 3.0 in their weakest/least favorite subject area. Twenty eight students scored an average at or above 3.0 in both their strongest/favorite and weakest/least favorite subject area. Two students scored an average below 3.0 in both their strongest/favorite and weakest/least favorite subject area.

Table 14

Strong Area and Weak Area Overall Averages by Student

QID1	Strong Mean	Weak Mean
0121-9733	3.90	3.97
0129-5272	2.63	2.23
0203-1849	4.20	3.88
0219-4841	3.33	3.43
0221-9443	2.85	3.03
0301-5833	3.65	3.35
0417-2356	4.00	3.23
0502-4210	4.02	3.77
0507-3973	3.55	3.03
0528-4806	4.07	4.27
06-06-9082	2.98	2.67
0604-5075	3.10	3.50
0620-7419	3.65	3.75
0624-7413	3.65	3.73
0625-9044	3.42	3.18
0708-1589	3.48	3.73
0807-2297	3.88	3.43
0812-1530	3.57	3.57
0910-9389	3.53	4.07
0930-4758	3.75	3.45
1017-2766	3.43	3.05
1028-6657	3.73	3.22
1029-3090	3.40	3.23
1122-0094	3.55	4.02
1202-7635	3.80	4.07

1204-2823	3.62	2.45
1213-4512	3.47	3.43
1215-1410	3.48	3.10
1223-1173	3.23	3.10
12298760	3.72	3.20
Anon 1	3.72	2.90
Anon 2	2.90	3.42
Anon 3	3.25	3.15
Anon 8	3.57	3.77

Note: QID1 = student id

CHAPTER 5: DISCUSSION

The purpose of this quantitative study was to develop a reliable and valid Likert scaled instrument which identified potential candidates for PBL in the adult high school completion population. The scale identified potential candidates based on their learning styles and personality traits. This chapter includes a restatement of the research questions, an explanation of the results, their implications, restatement of this study's limitations, next steps for further research, and a brief conclusion.

Research Questions

This study was driven by two research questions.

RQ1: What is the estimated internal consistency, reliability, as measured by Cronbach's alpha and adjusted by Spearman-Brown of the APBLI?

Following the factor analysis, the reliability of the scale for students' strongest areas was insufficient with a Cronbach's alpha of 0.489. The reliability of the scale for students' weakest areas was also insufficient with a Cronbach's alpha of 0.620. However, both instruments' subscale factor measurements raised to a sufficient level based on Cronbach's alpha and when adjusted by Spearman-Brown with the exception of factor 5 of the students' weakest area.

RQ2: What is the internal factor structure validity of the APBLI?

According to Campbell and Stanley (1963), there are eight threats to internal validity. They are: history; maturation; testing; instrumentation; statistical regression; selection; experimental mortality; and selection maturation interaction. Steps were taken during the administration of the instrument to reduce the threats to internal validity.

History was defined as "the specific events occurring between the first and second measurement in addition to the experimental variable" (Campbell & Stanley, 1963, p.5).

Maturation was defined as “processes within the respondents operating as a function of the passage of time per se (not specific to the particular events), including growing older, growing hungrier, growing more tired, and the like” (Campbell & Stanley, 1963, p.5). Students participated voluntarily either during their lunch break or immediately after school. This study included repeated measures that occurred one right after the other without breaks. During the administration of the instruments students were told during the instructions the administration would take approximately 25 minutes to complete. In actuality, the two administrations took students a minimum of 5 minutes 33 seconds, a maximum of 36 minutes 25 seconds, and on average 19 minutes 12 seconds. Therefore the study occurred in a short enough amount of time that neither history nor maturation were a threat to the internal validity.

Testing was defined as “the effects of taking a test upon the scores of a second testing” (Campbell & Stanley, 1963, p.5). It is possible that after the first administration student participants reflected on their learning styles and the reflection influenced their choices during the second administration. However, students were under no pressure to select an expected correct answer. They were given the freedom to choose the response that best reflected their opinion during both administrations.

Instrumentation was defined as “changes in the calibration of a measuring instrument or changes in the observers or scorers used may produce changes in the obtained measurements” (Campbell & Stanley, 1963, p.5). The only changes in the two administrations were changing the vantage point of “strongest/favorite subject area” to “weakest/least favorite subject area”. This minimized the treat to instrumentation.

Statistical regression was defined as “operating where groups have been selected on the basis of extreme scores” (Campbell & Stanley, 1963, p.5). Selection was defined as “biases

resulting in differential selection of respondents for the comparison groups" (Campbell & Stanley, 1963, p.5). Participants in this study contributed to this study using convenience sampling. Any student could participate and no students were turned away.

Experimental mortality was defined as "differential loss of respondents from the comparison groups" (Campbell & Stanley, 1963, p.5). This study used repeated measures and no students completed one part of the instrument without finishing the second.

Selection-maturation interaction, applies when "in certain of the multiple-group quasi-experimental designs, such as Design, is confounded with, i.e., might be mistaken for, the effect of the experimental variable" (Campbell & Stanley, 1963, p.5). This study was exploratory and had no experimental variable. Therefore selection-maturation interaction did not apply in this case.

Explanation of Results and Implications

According to the data analysis presented in Chapter 4, thirty out of thirty four students showed a propensity to do well in a PBL curriculum in their strongest area, thirty out of thirty four students showed a propensity to do well in a PBL curriculum in their weakest area, twenty eight out of thirty four students showed a propensity to do well in a PBL curriculum in both their strongest area and weakest area, one student showed a propensity to do well in a PBL curriculum in only their strongest area, two students showed a propensity to do well in a PBL curriculum in only their weakest area, while two out of thirty four students did not show a propensity to do well in a PBL curriculum in either area. The implication of this study is that within this sample of adult high school completion students, there are students whose learning style and personality traits are suited well for PBL.

Limitations

The APBLI was administered to adult high school equivalency students in one school in

Detroit. 56% of students were ages 18 – 28 and twenty eight out of thirty four self-identified as Black African-American. Therefore the findings apply only to this sample, and are not necessarily able to be generalized to other samples.

Another limitation for the analysis of students' scores is the interpretation of the average student score on the APBLI. Because the reliability of the entire APBLI instrument did not meet the 0.70 threshold according to Cronbach's alpha, the instrument must be analyzed based on its factors, which were found to be reliable using the Spearman-Brown correction (with the exception of F5 for students' weakest subject area). Because the instrument as a whole was not found to be reliable but the factors were found to be reliable, the APBLI could be considered five separate instruments that are administered twice through two different perspectives. Therefore caution must be taken in the interpretation of the students' averages of the subscales. Interpretation of the entire instrument's mean average could be problematic, for example, if a student's high score on one or more factors of the instrument were used to compensate for a low score on another factor. For all practical purposes, it would be best to analyze each student's factor scores to determine whether PBL would be an appropriate curriculum for that particular student.

Next Steps for Further Research

In order to obtain more information on the adult high school completion population, this study would need to be repeated in other locations with a sample size of at least 150 participants who vary in age, race, and location. If enough information is gathered to determine whether a substantial number of adult high school completion students possess the learning style and personality characteristics to do well in a PBL curriculum, it would be worthwhile to develop and administer a high school equivalent PBL curriculum. Afterwards, an analysis of the experience, educational outcomes, and career attainment of adult high school completion PBL students would

contribute to the field of andragogy.

Conclusion

An educational experience that allows the opportunity for individual investigation, to study one's own cultural heritage, and use a hands-on experimental learning approach are not available through current high school completion curricula. An individualized curriculum is only available through PBL. Based on the results of this study, a PBL curriculum is in demand for this sample, however no such option exists as of yet.

It is common practice for institutions of higher learning to grant honorary doctorates to substantial figures in politics, social justice, community activism, and a myriad of other fields based on their life's work. Similarly, many GED students have lived substantial lives that included entrepreneurship, family life, politics, social justice, community activism, and a many of other experiences. Yet, there is no option for less known members of society who have yet to fulfill their high school equivalence education to be bestowed a GED based on their life's work. PBL is an opportunity for the field of adult high school completion to adopt a wide-spread best practice in education that is based on students' individual learning needs. Although PBL might not be based on conventional standards of education (such as the Western Canon of literature, traditional scientific principles and the like), PBL allows for students to learn at a rigorous level based on their own interests and oftentimes rich life experiences.

Jean Piaget, the creator of the constructivist learning theory, "has been revered by generations of teachers inspired by the belief that children are not empty vessels to be filled with knowledge (as traditional pedagogical theory had it) but active builders of knowledge--little scientists who are constantly creating and testing their own theories of the world" (Papert, 1999, p.1). The theory that children need to explore, problem solve, and spend time on their interests is

now a best practice in education and delivered through PBL. The theory of constructivist learning applies no less to adult GED students. This is a population that has navigated life's milestones including family life, careers, and stumbling blocks without a high school diploma in a society where education is highly regarded and necessary for many life goals. They have numerous experiences, opinions, and curiosities that could contribute to society if given the opportunity. Offering curricula which use PBL as an option for the adult high school completion population is worth further research and evaluation based on the findings of this study.

REFERENCES

Acee, T., Kim, H., Kim, H.J., Kim, J., Chu, H., Kim, M., Cho, Y., & Wicker, F. (2010). Academic boredom in under- and over-challenging situations. *Contemporary Educational Psychology*. *35*. 17 – 27.

Alt, D. (2015). Assessing the contribution of a constructivist learning environment to academic self-efficacy in higher education. *Learning Environ Res, 18.* 47 – 67.

Bédard, D., Lison, C., Dalle, D., & Côté, D. (2012). Problem-based and project-based learning in engineering and medicine: Determinants of students' engagement and persistence. *The Interdisciplinary Journal of Problem-Based Learning, 6(2).* Purdue University Press.

Beder, H. & Valentine, T. (1990). Motivational profiles of adult basic education students. *Adult Education* Quarterly, *40*(2). 78 – 94.

Burgess, P. (1971). Reasons for adult participation in group educational activities. *Adult Education Quarterly, 22*(1). 3-29.

Campbell, D. T., & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research on teaching. In N. L. Gage (Ed.), *Handbook of research on teaching* (pp. 171–246). Chicago, IL: Rand McNally.

Carp, A., Peterson, R., & Roelfs, P. (1974). Adult learning interests and experiences. In K. P. Cross, J. R. Valley, & associates (Eds.), *Planning Non-Traditional Programs*. San Francisco: Jossey-Bass, Inc., 1974.

Carragher, L., & Golding, B. (2015). Older men as learners: Irish Men's Sheds as an intervention. *Adult Education Quarterly, 65*(2). 152 – 168.

Creghan, C., & Adair-Creghan, K. (2015). The positive impact of project-based learning on attendance of an economically disadvantaged student population: A multi-year study. *The Interdisciplinary Journal of Problem-Based Learning, 9*(2). Retrieved from

http://dx.doi.org/10.7771/1541-5015.1496

Davies, L. (1981). Adult learning: A lived experience approach to understanding the process. *Adult Education Quarterly, 31*(4). 227 – 237.

Deane, S. (1950). Who seeks adult education and why: A description of adult education participants. *Adult Education Quarterly,* October 1950.

DiVesta, Francis J. (1974). "Information-Processing in Adult Learners." *Adults as Learners: Proceedings of a Conference.* Edited by R.W. Bortner, S.S. Dublin, D. F. Hultsch, and J. Withall. University Park, PA: Pennsylvania State University, May 1974.

Dolmans, D. H. J. M., De Grave, W., Wolfhagen, I. H. A. P. and Van Der Vleuten, C. P.M. (2005), Problem-based learning: future challenges for educational practice and research. *Medical Education, 39.* 732–741.

Duty, S., Christian, L., Loftus, J., & Zappi, V. (2016). Is cognitive test-taking anxiety associated with academic performance among nursing students? *Nurse Educator, 41*(2). 70 – 74.

Flaherty, J. (1977). *A study of the functional needs of New Jersey adult basic education students.* New Brunswick, NJ: Center for Adult Development, Rutgers University.

Furnham, A., Batey, M., Martin, N. (2011). How would you like to be evaluated? The correlates of students' preferences for assessment methods. *Personality and Individual Differences,* 50.

Gardner, H. (2006). *Multiple Intelligences.* United States: Perseus Books Group.

Hair, J., Black, W., William, C., Barry, B., & Anderson, R. (2010). *Multivariate Data Analysis: Global Edition, Seventh Edition.* Pearson Education, Inc.

Hayes, E., & Valentine, T. (1989). The functional literacy needs of low-literate adult basic education students. *Adult Education Quarterly, 40*(1). 1 – 14.

Henry, G., & Basile, K. (1984). Understanding the decision to participate in formal adult education. *Adult Education Quarterly, 44*(2). 64 – 82.

Huddleston, C. (2014). Development of an instrument to measure student attitudes toward science fairs. Liberty University. Lynchberg, Virginia.

IBM Support (2018). FACTOR does not print KMO or Bartlett test for Nonpositive Definite Matrices. Retrieved from http://www-01.ibm.com/support/docview.wss?uid=swg21476768

Jang, H. W., & Park, S. W. (2016). Effects of personality traits on collaborative performance in problem-based learning tutorials. *Saudi Medical Journal, 37*(12), 1365–1371. Retrieved from http://doi.org/10.15537/smj.2016.12.15708

Knowles, Malcolm. (1998). *The Adult Learner*. United States: Butterworth-Heinemann.

Lam, D. (2004). Special section: Field education in social work. Problem-based learning: An integration of theory and field. *Journal of Social Work, 40*(3). 371 – 389.

Machnik, S. (1975). Articulation in the Constructive Use of Memory: A Design for Research. In M. O'Hara, S. Machnik, G. Morgenstern, C. Tansey, and E. O'Connor. "Creative Memory: Five Suggestions for Categorization of Adult Learning." *Adult Education, 26*. 32-52.

Martin, L. (1987). Life-style classifications of adult high school noncompleters. *Adult Education Quarterly, 38*(1). 32-45.

Mergendoller, J. R., Maxwell, N. L., & Bellisimo, Y. (2006). The effectiveness of problem-based instruction: A comparative study of instructional methods and student characteristics. *Interdisciplinary Journal of Problem-Based Learning, 1*(2). Retrieved from https://dx.doi.org/10.7771/1541-5015.1026

Michigan Public Act 249. Section (4)(6) Retrieved from https://www.legislature.mi.gov/documents/2015-2016/publicact/htm/2016-PA-0249.htm

Miller, Harry L. (1964). Teaching and learning in adult education. New York: The Macmillan Co.

Papert, Seymour. Mar. 29, 1999. *Child Psychologist Jean Piaget*. Time Magazine. Retrieved from http://content.time.com/time/magazine/article/0,9171,990617,00.html

Pintrich, P., Smith, D., Garcia T., & McKeachie, W. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement*, 53.

Poell, R., Vanderkrogt, F., & Warmerdam, J. (1998). Project-based learning in professional organizations. *Adult Education Quarterly, 49*(1). 28 – 42.

Porras-Hernandez, L., & Salinas-Amescua, B. (2012). Nonparticipation in adult education: From self-perceptions to alternative explanations. *Adult Education Quarterly, 62*(4). 311 – 331.

Qualtrics (2017). Qualtrics support: Export formats. Retrieved from https://www.qualtrics.com/support/survey-platform/data-and-analysis-module/data/download-data/export-formats/

Remijan, K. (2017). Project-based learning and design-focused projects to motivate secondary mathematics students. *Interdisciplinary Journal of Problem-Based learning, 11*(1). Retrieved from http://dx.doi.org/10.7771/1541-5015.1520

Ribeiro, L. (2011). The pros and cons of problem-based learning from the teacher's standpoint. *Journal of University Teaching & Learning Practice, 8*(1). Retrieved from http://ro.uow.edu.au/jutlp/vol8/iss1/4

Robinson, John. (1965). Exploring the range of adult interests. *Progress in Library Science.*

Edited by R.L. Collison. London: Butterworths.

Rose, M. (1998). Factors GED students attribute to persistence in postsecondary institutions. *The Learning Assistance Review, 3*(1). 40 – 57.

Rossing, B.; Long, H. (1981). Contributions of curiosity and relevance to adult learning motives. *Adult Education, 32*(1). 25 – 32.

Rothes, A., Lemos, M., & Goncalves, T. (2017). Motivational profiles of adult learners. *Adult Education Quarterly, 67*(1). 3-29.

Savery, J. (2006). Overview of the problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of Problem-Based Learning, 1*(1). 9 – 20.

Scanlan. C, & Darkenwald, G. (1984) Identifying deterrents to participation in continuing education. *Adult Education Quarterly, 34*(4). 155 – 166.

Schettino, C. (2016). A framework for problem-based learning: Teaching mathematics with a relationship problem-based pedagogy. *Interdisciplinary Journal of Problem-Based Learning, 10*(2). Retrieved from http://dx.dio.org/10.7771/1541-5015.1602

Shockley, K., & Frederick, R. (2010). Constructs and dimensions of Afrocentric education. *Journal of Black Studies, 40*(6). 1212 – 1233.

Slavin, R. (1990). Achievement effects of ability grouping in secondary schools: A best-evidence synthesis. *Review of Educational Research, 60*(3), 471-499. Retrieved from http://www.jstor.org.proxy.lib.wayne.edu/stable/1170761

Tas, Y, & Tekkaya, C. 2010. Personal and contextual factors associated with students' cheating in science. *The Journal of Experimental Education, 78*(4). 440 – 463.

Thomas, J. (2000). A review of research on project-based learning. Retrieved from http://www.bie.org/images/uploads/general/9d06758fd346969cb63653d00dca55c0.pdf

Thompson, D., & Wallner, J. (2011). A focusing tragedy: Public policy and the establishment of Afrocentric education in Toronto. *Canadian Journal of Political Science, 44*(4). 807 – 828.

Thurnlow, M, Cormier, D., & Vang, M. (2009). Alternative routes to earning a standard high school diploma. *Exceptionality, 17*(3). 135 – 149.

Tough, A. (1969). Why Adults Learn; A Study of the Major Reasons for Beginning and Continuing a Learning Project. Paper presented at the National Seminar on Adult Education Research (Toronto, February 9-11, 1969).

United States Census Bureau. (2017). About: Race. Retrieved from https://www.census.gov/topics/population/race/about.html

Waldrip, B., Cox, P., Deed, C., Dorman, J., Edwards, D., Farrelly, C, Keefe, M., Lovejoy, V., Mow, L., Prain, V., Sellings, Z., Yager, Z. (2014). Student perceptions of personalised learning: Development and validation of a questionnaire with regional secondary students. *Learning Environments Research, 17*(3), 355-370. Retrieved from http://dx.doi.org.proxy.lib.wayne.edu/10.1007/s10984-014-9163-0

Waldrip, B., Fischer, D., & Dorman, Jeffrey. (2009). Identifying exemplary science teachers through the students' perceptions of the assessment process. *Research in Science & Technological Education, (27)*1. 117 – 129.

Walker, A., & Leary, H. (2009). A problem based learning meta-analysis: Difference across problem types, implementation types, disciplines, and assessment level. *Interdisciplinary Journal of Problem-Based Learning, 3*(1). 12 – 43.

Warner, R. (2013). *Applied statistics from bivariate through multivariate techniques* (2nd edition). Thousand Oaks, Ca: Sage.

ABSTRACT

RELIABILITY AND PREDICTIVE VALIDITY OF THE *ADULT HIGH SCHOOL COMPLETION PROJECT-BASED LEARNING INSTRUMENT*

by

INGRID MACON

December 2018

Advisor: Dr. Shlomo Sawilowsky

Major: Quantitative Methods of Education Evaluation and Research

Degree: Doctor of Philosophy

The purpose of this study was to develop a reliable and valid instrument to predict adult non-high school degree holders who would perform well academically in a project-based learning (PBL) assessment environment to obtain their high school diploma as opposed to traditional standardized tests such as the *General Educational Development* (GED), Test *Assessing Secondary Completion* (TASC), and *High School Equivalency Test* (HiSET). For the purposes of the initial investigation, two dimensions were assumed based on this literature review: (1) Authenticity in learning and genuine curiosity; (2) Collaboration.

This instrument was found to be a reliable instrument based on the Cronbach's alpha of the subscales for nine of ten of the subscales. The instrument was found to be a valid instrument based on a literature review of project-based learning and an assessment of the questions by a panel which included experts in project-based learning and experts in adult high school completion programs.

AUTOBIOGRAPHICAL STATEMENT

My interest for best practices in education began when I completed my high school community service graduation requirement by volunteering at a local elementary school and I never turned back. At the University of Michigan – Ann Arbor (U of M) where I completed my undergraduate studies, I tutored and mentored high school students in Detroit, Michigan with the student volunteer organization Intellectual Minds Making A Difference. Following graduation, I taught English as a second language in France then went on to receive my Master of Arts in Teaching at U of M. I began my career as an educator teaching math in Detroit. In my classroom, I experimented with different methods of education with a strong emphasis on conceptual understandings using hands-on minds-on learning experiences rather than memorization of procedural steps. My latest classroom experience was as an adult high school completion instructor in Detroit. I enjoyed working with adults with varied life experiences and different motivators, but who all had the same goal: Sanfoka, the Asanta Adinkra symbol meaning "to go back and get it" and "to reflect on your past in order to progress in your future."

The motivation for this dissertation is the varied life experiences of my adult high school completion students. Their experiences span the spectrum of homelessness to entrepreneurship, all of which made them who they are. Although they may not be proficient at the Pythagorean Theorem or the Law of Conservation of Mass, they are problem solvers who have strengths and intelligence that might not be captured by a standardized test. The accumulation of their knowledge deserves formal recognition. My hope is this dissertation will add to the body of knowledge concerning andragogy and best practices in adult high school completion programs.

My future career goals include changing the culture of education in Detroit, psychometrics, statistical analysis, and educational administration.