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Time Effectiveness of Virtual Support Group for Adult Learners: a Quasi-Experimental Retrospective Correlational Study

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Abstract
Can virtual support be effective in helping adult students focus on their educational goals? The answer to this question is broadly addressed in this paper with specific reference to adult students qualifying to enter into the Real Estate profession in Florida. The present investigation, in fact, is directed on ways to provide virtual support to adult learners, such as the ones seeking to earn a real estate license. In Florida the process of earning a real estate license is quite intense and require filing an application for licensure and paying the relative fee, getting fingerprinted and passing a criminal background check, and taking a qualifying education class and passing a state test. During the last step of this process about 50% of the pool of qualified candidates fails. It is unknown what percentage of the initial pool of aspirants drops during the application process, but an estimate developed during the course of the present study indicates that the possible pathways for failure are more numerous than the possible pathways leading to the learners' success. In a quasi-experimental retrospective study, a cohort of one hundred forty students was divided into two groups an experiment group receiving virtual support and a control group not receiving virtual support. The difference in the performance of the two groups was analyzed by calculating the licensure time and comparing the differences between the two with the t-student test. The results of this analysis show that virtual support provided by WhatsApp or text messages may improve students' licensure rate and help them reaching their educational and professional goals.
Keywords: Florida, Real Estate, Applicants, Students, *quasi*-experimental
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1. Background

Virtual support has been proven significantly effective in various educational contexts (Heradio, de la Torre, Galan, Cabrerizo, Herrera-Viedma & Dormido, 2016; S. Knowles, Stelzer & O'Connor,2017; Pereira, Martins, Morgado, Fonseca & Esteves, 2017; Potkonjak et al., 2017; Zlotos, Power, Hill & Chapman, 2016). Virtual support in an educational context can be delivered via a virtual community (Beckert, n.d.; Ye, Feng & Choi, 2015), by instant communicator and via other social media (Wellman & Gulia, 2018; McLoughlin, et al., 2017).
WhatsApp is a software program written in Erlang. WhatsApp can run on operating systems of both personal computers and cellular phones. Communication programs running on cellular phones are commonly referred as applications or, shorthanded, apps. The mother company of the program, Meta Inc., developed the code and launched it in January 2009 (Molina, 2017). The main use of WhatsApp is communication free of charge, other than network usage associated charges, across the world. Since the download and installation of the app is free, WhatsApp can be referred to as a freeware. WhatsApp is the most used messenger across the world (Schwartz, 2016).

With specific reference to the instant communicator WhattsApp, Giordano et al. (2017) performed a comprehensive and systematic review of the utilization of WhatsApp as telemedicine tool. Giordano et al. (2017) observed evidence of the robustness of the WhatsApp application in a review of 30 studies published in peer review journals. Giordano et al. were not the only one to explore the application of WhatsApp in the educational arena: Raiman, Antbring and Mahmood (2017), and Bouhnik and Deshen, (2014) focused the attention on the effectiveness of WhattsApp as teaching aid. On the topic of the use of instant messengers in education one could argue a negative effect on students' performance (Ahad & Lim, 2014; Alwagait, Shahzad & Alim, 2015; Lau, 2017). Extensive studies by Wellman and Gulia (2018) and the present investigation, demonstrate the usefulness of WhattsApp when its use is properly framed in an educational context.

The problem is the effectiveness of virtual support groups in Florida real estate pre-licensure classes is unknown. According to the Florida licensing agency, every month about three to five thousand qualified candidates take a Florida Real Estate or Real Estate Appraisal licensure test (Department of Business and professional Regulations Bureau of Education and Testing, 2017) but only a small, sometimes minimal percentage of aspirants achieve their licensing goals. A proprietary school could benefit from the finding of this study by deploying techniques that ultimately lead to an increase in students' success rate, thus its reputation.

Additionally, while the study focuses on the is the broader population of Florida real estate applicants, its conclusions could be likely expanded to other contexts.

The significance of the study is two-fold. For a small proprietary school, it is to improve its reputation by increasing pass rates. For students: to achieve some feeling of accomplishment by finally reaching one of life objectives. Findings, ancillary to the present investigation, show, in fact, every year an amount of money between one and three million US Dollars are literally wasted by Florida Real Estate Aspirants. The amount of wasted money is estimated by calculating the bottom limit as the product of the failing test takers times the $35 exam fee, and by assuming a similar population spends an average of $100 without ever becoming a qualified applicant. The extent of the affected by the finding of the present investigation is not only limited to the Florida real estate applicants, but it can be eventually expanded to other contexts. For example, ascertaining the effectiveness of virtual support in a community education class may directly affect aspirants residing outside the state of Florida, receiving the benefits of the virtual support. Additionally, the findings of the present investigation could be extended to other professional and community education contexts.

1.1 Research Questions

The study, carried out in the present investigation was designed to answer the two following research questions:
Research question (1): "Is there a correlation between students' involvement in a virtual support group (independent variable) influence the time it takes for a student to pass the state test for real estate licensure (dependent variable)?"

Research question (2): "Is the correlation between students' involvement in a virtual support group (independent variable) and the time needed for a student to pass the state test for real estate licensure (dependent variable), if any, positive, or negative?"

1.1.1 Hypotheses

The hypothesis on which is based the first research question ($H_1 1$) is: there is a correlation between the success rate of the students participating in a virtual support group and academic success rate measured as the percentage of students obtaining a license. The null hypothesis ($H_1 0$) for the first research question is: there is no correlation between participating in a virtual support group and academic success measured as students obtaining a real estate license.

The hypothesis for the second research question ($H_2 1$) is: students' involvement in a virtual support group (independent variable) has a negative correlation with the time for a student to pass the state test for real estate licensure (dependent variable) in Florida: Students that received virtual support experienced shorter licensure times. The alternate hypothesis ($H_2 0$) reads: "There is no correlation between students' involvement in a virtual support group (independent variable) and the time for a student to pass the state test for real estate licensure (dependent variable) in Florida".

1.1.2 Theoretical Framework

Engaging learners in a virtual context asking students to perform simple tasks for a virtual reward may be identified as a unique form of transactional leadership. Under the transactional leadership theory reward is given by the leader at the fulfillment of a specific task (Aamodt, 2016). Transactional leadership encompasses a wide variety of leadership styles and may potentially lead to negative consequences. Because of the simple mechanisms of transactional leadership, when properly enacted, becomes effective. Convincing students to memorize details of the material, such as the number of days to cancel a contract or to notify a change of address may be challenging. As summarized in Table 1, elements of transactional leadership include clear objectives, respect for the organization, and an immediate reward system (Burns, 1998).

The ARCS model of motivational design theories can be applied to support the present study (Li & Keller, 2018). Under the ARCS model of motivational design four items contribute to students' success: attention, relevance, confidence, and satisfaction. By engaging students *via* a virtual communicator directly on the respective phones, the instructor can generate the perceptual arousal needed to gain the full attention of the student. The instructor only communicates about topics strictly related to the students' success. Even reminders such as the need of timely filing an application for licensure, are important for the students' ultimate goal of getting license. As students can choose when and how to answer in an asynchronous environment, students do tend to answer only those inquiries for which the earn some positive virtual recognition, building up self-confidence, and ultimately satisfaction about students' own work as students see the respective posts acknowledged in real time by the instructor.

The present study is a specific embodiment of the transactional leadership theory combined with the ARCS model of motivation. The elements of expecting students' performance, typical of the transactional leadership, and surprise, as in the ARCS model, are combined in a unique virtual environment. In a real, live, class a student could be intimidated by being challenged in front of other participant, while in a virtual environment where the performers are publicly recognized, and the low performers are not weeded out, the participant enjoy the feeling of anonymity which make feel secure. Live class interactions need to be alternated to virtual interaction, as the

latter ones only provide support for the learner: while the bulk of the work is done in a real classroom.
Because of the specificity of the challenges posed to the students, the instructor bears the burden of dissecting the material in simple, components testable within the simplicity of a text message. The process of breaking down the material into simple building blocks not only make suitable for a challenge-reward system but demystify the complexity of longer chapters often keeping the students away from the books.

1.1.3 Definitions of Terms

Applicant: an aspirant with a completed application for Real Estate licensure on file with the Florida Department of Business and Professional Regulations (DBPR).
Application date, retrieved from public record: the date on which the aspirant files the application. On the application date the aspirant ceases to become an aspirant and becomes an applicant.
Aspirant: an individual who expressed, at some point, the intention of earning a Florida Real Estate license. Figure 1 illustrates the relationship between Aspirants, Students, and Qualified Applicants.
Certificate date, or *course completion date*, retrieved from proprietary archival data: the date a student completes the mandated pre-licensing course and pass the end of the course examination.
Control group, retrieved from proprietary archival data: a group of students which did not participate in the treatment.
Enrollment date, retrieved from proprietary archival data: the date an applicant or an aspirant enroll in a Florida State Approved pre-licensing course. On the enrollment date an aspirant, or an applicant, ceases its status to become a student.
Experiment group, retrieved from proprietary archival data: a group of students which participated in the treatment.
Licensee, retrieved from public record: an individual holding a license under part one of Florida Statute 475.
Licensing time, the dependent variable in the study: the number of calendar days between the certificate date and the licensure date.
Licensure date, retrieved from public record: the date a qualified applicant fulfills all the outstanding application requirements and earns a Florida Real Estate license.
Qualified applicant: an applicant whose all Florida real estate application requirements, including passing a criminal background record, and paying the application fee, have been satisfied but for passing the licensing examination.
Treatment, or *intervention*: an instructor mediated discussion on the instant communicator WhatsApp.

1.1.4 Assumptions and Limitations

Not all the elements of the present investigation are cast in stone, neither all the information needed is available from reputable sources or from public records. Assumptions need to be made. One of the assumptions of the present study is the size of the population of Florida real estate license aspirants (D'Ottone, 2019). The assumption on the size population of the Florida real estate license aspirants is not critical for the outcome of the investigation, rather its importance is needed for a proper quantification of the significance of the study.

Another, statutory, assumption of the present study consists in the licensure date cannot exceed two years or 730 days. Under current Florida Real Estate license law, in fact, after two years pass from the certificate date, as defined above, the pre-licensing education credits expire, and the student needs to take the pre-qualifying education class again.

The scope of the present investigation is limited to the analysis of the outcome in terms of licensure time defined as the number of calendar days between the certificate date and the licensure date, of a group of students who attended a small proprietary real estate school in the temporal interval between the fourth quarter 2015 and the first quarter 2018. The average licensure time of an experiment group, for which virtual support via the instant communicator WhatsApp was provided is compared with the average licensure time for a control group, for which the virtual support was not provided.

The limitations of the study then are both temporal and geographical in nature, but other limitations of different nature, such as demographic limitations may be embedded into the study.

The main limitation of the present investigation lay in its research design. Being a *quasi*-experimental retrospective observation on students at a proprietary school in South Florida, its external validity, intended as the ability to transfer the results of the investigation to other contexts, is limited (Cor, 2016). *Quasi*-experimental design is fact, while widely accepted has a recognized limited transferability (Delucchi, 2019). The limitations generated from the common geographical origin of the participants in the study (Miami Dade County, Florida), and by the limited temporal distribution of the study ranging ten quarters from the fourth quarter of the year 2015 to the first quarter of the year 2018. Other factors possibly affecting the outcome of the study are a limited turnout of participants willing to sign off an informed consent, or a possible limited demographic of the participants.

1.2 Literature Review

According to the Florida licensing agency, every month about three to five thousand qualified candidates take a Florida Real Estate or Real Estate Appraisal licensure test (Department of Business and professional Regulations Bureau of Education and Testing, 2017) but only a small percentage is successful. For a school engaged in the business of preparing Florida Real Estate licensees' aspirants, the understanding of the roadblocks on the pathway to licensure is critical. The problem is not limited to Floridians, but extends to individuals from other states, territories, and countries desiring to earn a Florida Real Estate license. In addition to the low passing rates of the Florida Real Estate licensure exam, other states, such as California, may be subject to similar considerations (Admin, 2018). In 2017 for example 55,318 California Real Estate licensure exams were administered, but only 25,116 Sales Associates licenses were issued, suggesting California as one of the states subject to considerations similar to Florida.

Current literature outlines several applications of virtual support in different context including the medical and allied sciences field (Raiman, Antbring, & Mahmood, 2017; Giordano, Koch, Godoy-Santos, Belangero, Pires, Labronici, 2017), include teaching foreign languages (Baek, Yoo, Lee, Jung, & Baek, 2017; Jin & Zhirui, 2017), and include the construction industry (Li, 2015). Limitation of the introduction of virtual support in an educational context include the possibility for reduced emotional engagement (Johnson & Lowe, 2015), the need for specialized hardware (Greenhalgh et al., 2016), and potential distraction (Voinov, Coltekin, Chen, & Beydoun, 2018). There seems to be an agreement amongst scholar about the advantages of adopting virtual communicators in education greatly overcome the disadvantages (Qiao, 2018).

Foss (2015) articulates six steps for developing literature research: deciding the area of research, perform the literature search in relevant databases, locate important excerpts, data, or quotations for each item returned by the search, code the literature into a themed organizer, create a conceptual framework for the own literature review, and drafting the manuscript. When selecting the topic, the main inquiry was whether there were other studies directed to the same research topic or not (Foss, 2015). Likely no information, other than generic websites, including blogs, and lower quality internet sites were identified dealing with the fate of Florida Real Estate licenses' aspirant. Absolutely no literature was found with respect to the application of virtual support to Florida Real Estate education. In the process of selecting the topics three separate components were identified, these three components were sufficiently separate to allow for separate searches (Kuusinen & Watson, 2018):A first components dedicated to the identification of general learning theories with respect to continuing and professional education; a second component dedicated to the most relevant information regarding the Florida Real Estate licensing system; and a third component inquiring how distant communicators educational and support techniques are applied to community and professional education (Hartas, 2015).

Performing a literature review of educational literature is somewhat a daunting task as it requires the identification and selection of the most relevant peer reviewed articles out of an enormous amount of published material. Dutt, Aghabozrgi, Maizatul, Ismail, and Mahroeian (2015) suggested the use of clustering algorithms when screening educational databases for relevant literature. Data clustering consists in gathering items out of databases, having common features. For scholarly articles, important features are identified in key words present in the documents (Dutt et al., 2015). Computer codes, such as clustering algorithms can be used for the screening and identification of relevant literature. However, the results produced by a search performed with a clustering algorithm are not organized, and their relevance or impact in the body of published literature is often ignored (Dutt et al., 2015). Dutt, Ismail, and Herawan (2017) reviewed different strategies to locate documentation relevant to prepare a literature review directed to the educational field. They classified clustering techniques in two broad categories: hierarchical and partitional. In a hierarchical clustering algorithm the first keyword is given more importance. Out of the result containing the first key word, a subsequent search is performed to locate the second keyword (Dutt et al., 2017). In a partitional clustering algorithm the results containing the first key word are subsequently split based on whether they contain or not the second keyword.

Important multidisciplinary databases such as Elton B. Stephens Co.(EBSCO), Journal Storage (JSTOR), ProQuest, and Institute for Scientific Information (ISI) were searched by using keywords such as Real Estate, Real Estate Education, Florida Real Estate License, Virtual Support, Virtual Communicator, and Virtual Communities. The items returned by the Boolean search of the databases mentioned above were then screened for relevance based on the following criteria (Kuusinen & Watson, 2018): a first criteria was the applicability to the present study, the second criteria was the year of publication. According to the first criteria an item, article, book, or other media, was selected for consideration only if applicable to the present investigation. Under the second criteria only items published since 2015 were selected (Hartas, 2015). If no relevant article was found meeting the two requirements, then the search was extended to older items. Because the investigator has been practicing in the field of Real Estate Education since 1998 some of the more empirical references were already known. Because of the many legal references being related to the subject of interest the guidelines by Nuruddeen (2015) were adopted to determine the relevance, or the lack thereof, for the determination of a research gap.

1.3 Theoretical Framework

The present study leans toward transactional leadership theory (Weber, 1947). Transactional leadership is a goal-oriented style of leadership (Aamodt, 2016). Transactional leaders focus on the goals and objectives of the organization and derive their priorities from a careful analysis of the process needed to achieve them. In the professional and community education environment one could argue about the existence of implied partnership between the students and the institution attended, as to where the students succeed the institution earn positive feedback and builds up its reputation (Beckers, van der Voordt, & Dewulf, 2016). An instructor following the transactional leadership theory, would set its students' success as the school's number one priority. Since simply imparting orders to the students to perform certain tasks is not necessarily an effective way of motivating them, the transactional leadership theory need to be combined, in some way with a motivational approach (Deichmann & Stam, 2015).

Here the transactional leadership theory is combined with the Attention, Relevance, Confidence, and Satisfaction (ARCS) model of motivation (Li & Keller, 2018). The elements of expecting students' performance, typical of the transactional leadership, and surprise, as in the ARCS model, are combined in a unique virtual environment as suggested by Chang & Cheng (2015). In a real, live, class a student could be intimidated by being challenged in front of other participant, while in a virtual environment where the performers are publicly recognized and the low performers are not weeded out, the participant enjoy the feeling of anonymity and security.

The ARCS model of motivation, as described by Li & Keller (2018), incorporates specific features for each of its elements. When capturing a learners' attention, one should leverage on the interest of the learner and possibly on its willingness to participate in classroom activities such as games, role plays or other interactive practices. Other ways to awaken learners' attention is to create situations that spark conflict, at least at the intellectual level, in a classroom: animating the basic instincts of the students and channeling into a discussion (Deichmann & Stam, 2015). Under the teachings of the ARCS models, other ways to create an attentive audience include the use of humor, the introduction of variety, and real-world examples.

Li and Keller (2018) suggested linking the instructional topics to learners' prior experience when it comes to motivating students. The link created in such a way is sympathetic with one of the six assumptions of andragogy (Cochran & Brown, 2016). Other ways suggested for underscoring relevance by the ARCS model include emphasizing the actuality of the topic, project its perceived future usefulness, allowing students to model different scenarios, and or giving choices with respect to the proper instructional strategy to be followed when dealing with a specific topic. Confidence, the third component of the ARCS model is stimulated by clearly stating objectives, expectations, and prerequisites to the learners making them aware of what is expected from them. Providing timely feedback is also a way of promoting confidence in the learners as they benefit from the instructor's leadership. Li and Keller (2018) suggested praise and reward as the most effective ways to promote a feeling of satisfaction in the learners. Both praise and reward must be done in an immediate fashion though to allow a clear perception of the link between the learners' action and the reward.

The ARCS model fits teaching practices in a community college environment as in the busy lifestyle that most of adult students' experience, a substantial amount of motivation is needed to reach the students' educational objectives (Reynolds, Roberts, & Hauck, 2017). Live class interaction needs to be alternated to virtual interaction, as the latter ones only provide support for the learner: while the bulk of the work is done in a real classroom. In a qualitative analysis of three case studies Reynolds et al. (2017) found increased motivation toward learning in students presented with instructional designs based on the ARCS model.

Because of the specificity of the challenges posed to the students, the instructor bears the burden of dissecting the material in simple, testable components within the simplicity of a text message: on the other hand, the process of breaking down the material into simple building blocks, not only make it suitable for a challenge-reward system, but demystify the complexity of longer chapters which often keep the students away from the books (Reynolds, et al. 2017). Lucey (2015) in a semester long study applied distance instructional techniques to carry on tasks like presenting the material or explaining hard to understand concepts to students. Lucey's work was based on a wide array of instructional techniques described by Benjamin (2014). After a full semester introducing new concepts and testing students, Lucey's findings consisted in an emphasis on flexibility when teaching using distance instructional techniques. In other words, each audience has its own means of communication: the most effective means to relate an instructional message are the ones already in use by the audience (Lucey, 2015).

Different current instructional designs have been inspired by the ARCS model of motivation (Aşıksoy & Özdamlı, 2016; Chang, Song, & Fang, 2018; Millman & Wessmiller, 2016). Some are directed to flipped classroom, an instructional strategy where contents are often delivered outside instructional time (Aşıksoy & Özdamlı; Chang et al.). A flipped classroom also referred to as "Web-based self-study and classroom discussion" allow students to take the initiative when it comes to learning. Students are exposed to the material on their own time, while they work on practical problems related to their field of study under the guidance of an instructor

(Chang et al.). In a 66 students sample divided into an experiment and a control group, Aşıksoy and Özdamlı (2016) observed better performance of the experiment group over the control. They explain the difference between the performance of the experiment and control groups with an increased level of satisfaction due to the ARCS learning practices embedded in the instructional practices followed for the experiment group.

While the work by Aşıksoy and Özdamlı (2016) was focused on Physics students, Chang et al. (2018) investigated the effectiveness of the ARCS model of motivation in a Problem Based Learning (PBL) context for computer science students. Chang et al. (2018) also found that on a sample of about 100 students, the experiment group, undergoing flipped classroom instruction inspired by the ARCS model of motivation, averaged a higher score (86.92) over the control group (76.57) (Chang et al., 2018).

Gullu and Delialioglu (2018) extended the observation on the ARCS model of motivation as it applies to current teaching practices, to computer simulations finding in favor of computer applications in the context of ARCS inspired instructional designs. In the specific, by applying a quantitative methodology to a qualitative experimental design to evaluate students' attitudes toward computer simulations. The Gullu and Delialioglu (2018) study was conducted over a sample of 17 students enrolled in a computer science class during the 2014-2015 Academic Year. Semi-structured interviews, consisting of 11 open ended questions, were carried out with the aim to explore students' motivations, attitudes, and expectations. Goal settings turned out to be the highest ranked factor in determining students' motivations toward the field of computer networking. In the open-ended interviews, students expressed their opinion: in the information age, the ability of working connected to a computer network is a critical for their professional development.

With specific reference to the present investigation, Keller, Ucar, and Kumtepe (2018) analyzed different embodiments of the ARCS model of motivation in a distance learning environment. Because the present investigation utilizes a combination of live teaching meetings with distance learning motivational techniques the ARCS model represented the best fit out of the different learning and leadership theories.

Pedagogy and andragogy are two different learning theories respectively directed to young and adult learners (Taylor, 2017). Since the present study is directed to adult learners, andragogy is the most appropriate theory to use. The Real Estate licensing system in the State of Florida is designed to license efficiently and regulate fairly, but the pass rate at the state licensure test hardly pass 40% (Bureau of Education and Testing, 2017). The statistics divulgated by the state do not account for a substantial, but unaccounted, amount of dropped students. The reasons for dropping going unaccounted in the application process are other than failure to pass the state licensure test. The present investigation builds on published peer reviewed studies to evaluate the effectiveness of virtual support delivered via an instant communicator to Florida Real Estate students.

Teaching, in its original form, was designed to help youngsters to benefit of the experience of older mentors (Ouza, 2016). The teaching practice directed from adult to young would be referred as to pedagogy as it implies the engagement of young students. Pedagogy, over time has been embodied in several different manifestations, including critical pedagogy, dialogic learning, student centered learning theories, and Herbartianism (Compayre, 2015). Freire (2018) gave a particular meaning to pedagogy highlighting the lack of a collaborative process. Freire also emphasized the existence of a process where the authority, identified in the teacher, transfers knowledge, to the oppressed, identified as the learner. Under Freire pedagogy assumes the features of a "*banking model of education*" where knowledge is transferred rather than originated. Both student and instructor become then dehumanized in the process assuming almost the features of a business transaction.

Andragogy on the other hand, is a term used to design a problem-solving form of education often directed to adults (Ouzah, 2016). Andragogy is based on six assumptions including: the need for learning, the respect for the self-concept of the learner, the role and the experience of the learners, the analysis of the readiness of the learner to acquire new concepts, the orientation toward learning, and the motivation for learning (Ferreira & McLean, 2018). Still, under the teachings of Ferreira and McLean (2018), andragogy is a learning theory molded around the characteristics of the learner, in a way opposite to pedagogy. According to a summary analysis one could almost conclude andragogy earned all the credits, and pedagogy would not contribute to human development at all. It is just not so simple. Andragogy and pedagogy are two learning theories adapted to different stages of life. If properly implemented andragogy and pedagogy are actually a complement to each other, as both andragogy and pedagogy help, in a way, the learner in its life journey (Taylor, 2017).

1.4 The Florida Real Estate Licensing System

Real Estate is an industry playing a vital role in Florida's economy. For example, Florida commercial Real Estate has been estimated to be ranking third in the Nation in terms of volume (Fuller, 2018). The evolution of the Florida Restate industry has been described in great detail by Weinkle (2015) and references therein, beginning with the discovery of a new territory called "Pascua de Florida" in 1513 by Ponce de Leon, passing through the Florida land boom and bust of the 1920s, and exploring the more modern trends at the beginning of the 2000s (Cummings, 2006). Originally Florida was a hard to sell land, mainly characterized by swampland allowing rich speculators from up North, such as Hamilton Disson, to purchase large tracts of land at bargain

prices. After almost 200 years of development Florida land became a hot commodity looked after by developers and speculators. According to a statistics of the National Association of Realtors (NAR), in 2004 about 23% of Americans were purchasing real estate as a form of investment, and another 13% as second home (Weinkle, 2015). Florida would fall in line with these numbers. As Real Estate assumed a more prominent role in the state economy, the Florida Real Estate profession went from an unorganized, and self-directed occupation heavily inspired by speculators, to a more formally organized profession.

An overview of the global trends in Real Estate education, with specific reference to the Singapore market is provided by Yu (2016). Yu describes how different jurisdictions focus of various aspects of the industry, some establishing strict licensing requirements, others leaving the ability of the individual to establish a professional Real Estate practice to its own initiative. In this context it has been observed that more and more high-level practitioners acquire graduate degrees that provide the level of specialization needed to become successful in an extremely competitive market (Martens, 2016). Kim and Prior (2018) take a closer look at differences and similarities between the Real Estate education requirements in the United Kingdom (UK) and in the United States (US). According to Kim and Prior (2018) the American Real Estate Society (ARES) emerges as the leading institution for Real Estate educational research in the US. Through the peer reviewed publications of its journals ARES provide exemplary expectations of what is needed from licensees nationwide. Under the US model, terms such as Ethics and historical values are inspiring principles in Real Estate education, underscoring the importance for the licensees to "do the right things" even in a void of regulation (Kim & Prior, 2018).

Curtis (2005) described the process of obtaining a Florida Real Estate license in great detail. In her 2005 article Curtis compared and contrasted the Real Estate licensing process with other state regulated professions. In Florida Real Estate Brokers and Sales Associates act under chapter 475 part I of Florida Statute (2017). Established in 1925 by the Florida legislature, the Florida Real Estate Commission (F.R.E.C.) is the political entity overseeing the practice of the profession (Schwartz, 2016). The commission is composed by seven members appointed by the Governor and confirmed by the State Senate. Administrative services are provided by full-time employees of the Division of Real Estate (D.R.E.) of the Florida Department of Business and Professional Regulation (D.B.P.R.).

There are two kinds of Real Estate licenses in Florida, either Broker or Sales Associate. To earn a Real Estate Sales Associate license, aspirants need to complete a pre-licensing class consisting of at least sixty fifty minutes hours and pass an end of the course examination with a passing grade of 75% or better (now 70% or better). The end of the course examination is composed of 100 multiple choice questions (MCQ) having a stem and four possible options: three distractors and one correct answer. In addition to the specific academic requirements, applicants need to satisfy minimal educational requirements of having earned a high school diploma or its equivalent, need to have a social security number to eventually allow the Florida Department of Revenues (Fl D.O.R.) to charge child support, and must be 18 years old or older (Crawford, 2017).

The term aspirant is an informal term not found in the Florida Statutes, but, for the purpose of the present study, it is used to qualify an individual beginning the process of getting licensed, before filing an application for licensure. Aspirants then, to become applicants, need to file an application through a centralized computer system or on paper, and pay a fee. After filing an application, the term used to qualify the individual becomes an applicant, and if the application is approved a qualified candidate (Lofton, 2017). Qualified candidates though, still do not have a license, rather the qualified candidates need to pass a 100 MCQ state exam with a score of 75% or better to finalize the licensing process and become licensee (Crawford, 2017).

Figure 2 illustrates the Florida Real Estate State licensure test performances expressed as a percentage of the total number of qualified candidates respectively for the Sales Associate and for the Broker exams for the fourth quarter 2015, for the entire year 2016, for the entire year 2017, and for the first quarter 2018 (Bureau of Education and Testing, 2017). Once passed the state exam for licensure, in fact, a license number gets originated associated with the successful candidate for licensure.

The last administrative step to be fulfilled before beginning to practice is to activate the license number with a broker or a brokerage firm (Department of Business and Professional Regulations, 2018). The point in case is that every step of the application process can lead to a myriad of reasons to fail and get dropped out. One thing is sure: as summarized in Table 2, out of the aspirants successfully reaching the status of approved candidate only 40% become licensed (Bureau of Education and Testing, 2017). The multiplicity of dropout paths underscores a percentage in excess of the 60% of qualified applicants failing the state licensure test, where the excess is due to several other and unaccounted ways for an aspirant to fail, consequently losing money, time, and motivation. The detail study of these paths is beyond the scope of the present investigation, but it should be subject of further studies (D'Ottone, 2019).

Crawford (2017) and Collins (2018) described in detail the activities of a Florida Real Estate Broker, and how Florida Real Estate licensees build their practice on the knowledge of the FREC I (Florida Real Estate Commission, 2015) Syllabus. Specifically, Crawford addressed the law of Agency in Florida covered in Chapters 4 of the FREC I Syllabus, while Collins explained the legal theories of compensation for Florida Real

Estate Brokers discussed in chapter 11 of the FREC I Syllabus (2015). Remarkably, little or nothing has changed since then in terms of theoretical framework. Consequently, these chapters, together with chapter 5 (Real Estate Brokerage Operations) of the F.R.E.C. I Syllabus still represents an important component of the state licensure test. As described in the 2018 Candidate Information Booklet (C.I.B.) these three chapters alone, represents about 31% of the state exam total number of questions.

Common traits of Real Estate professional nationwide are outlined by Anderson, Guirguis, & Turnbull, (2018). These traits include basic demographics including level of education, gender, and earning expectations. While the numbers may have changed since then, Anderson et al. portrait in detail the activities of Real Estate licensees. With respect of the statistics, the National Association of Realtors (N.A.R.), and the United States Census Bureau, provide reliable current estimates for most of the indicators. For example, if a Real Estate agent in the year 1990 earned a median income of $41,489, according to the 2017 US Census Bureau (United States Department of Labor, 2017) a Real Estate agent in 2017 earns a median income of $45,990. In outlining the pros and cons of the Real Estate profession, Anderson et al. point out the correlation between the low barrier of formal education, the ability of making ones' own hours, and the potentially unlimited earning capacity are all factors contributing to the decision-making process of entering the profession.

1.4.1 Current Challenges with the Florida Real Estate Licensing System

Historically one of the challenges of real estate schools in Florida has been to increase the pass rate of their students at the state licensure exam. The Florida Real Estate Sales Associate and Florida Real Estate Broker state exams are relatively challenging exams with low pass rates. If one looks at the success rate of aspirants for a Florida Real Estate license from the point of view of the school administrator, the scenario is less than perfect (Lofton, 2017). According to the Florida Department of Business and Professional Regulations, every month about three to five thousand qualified candidates take a Florida Real Estate or Real Estate Appraisal licensure test (Bureau of Education and Testing, 2017). Table 1 reports the Florida Real Estate State licensure test performances respectively for the Sales Associate and for the Broker exams for the fourth quarter 2015, for the entire year 2016, for the entire year 2017, and for the first quarter of the calendar year 2018. These data are provided by the test vendor, Pearson-Vue, and are published as a matter of public records by the Florida Department of Business and Professional Regulations. The original sets of data provide separate information for first time test takers, and for repeaters, the data of Table 1 are the totals.

For the Sales Associate state licensure test the mean pass rate averaged out over ten quarter is 42% associated to a standard deviation of 1.6%. The median is 42% while the mode is 40%. The range for the monthly Sales Associate pass rate goes from a minimum of 37% to a maximum of 44% in the ten quarter under consideration. For the Real Estate Broker test the ten quarters average pass rate is 50% associated to a standard deviation of 5%. The median is 50% while the mode is 55%. The range for the monthly Real Estate Broker pass rate goes from a minimum of 42% to a maximum of 68% in the ten quarters under consideration. Figure 1 is, in fact, a pictorial representation of the data in Table 1. In the ten quarters under consideration about 60% of the qualified candidates taking the state licensure test every month fail (Bureau of Education and Testing, 2017). The chart shows passing rates having been steadily lagging around 40% (D'Ottone, 2019).

The 40% pass rate can be interpreted in the sense of having ten qualified applicants standing the state test every month, out of which four pass and six fail. In addition to these low pass rates, there are other paths which may lead to failure (Brown-Climer, 2017). The public record does not necessarily provide information on the ultimate fate of the qualified candidate, classified in the sense into two groups: first time takers and repeaters, but the record does not make clear whether the qualified candidates drop their attempts of getting licensed after a failure, or if qualified candidates keep trying and what is the success rate of these attempts (Bureau of Education and Testing, 2017). In other word a qualified candidate may just decide after a critical number of fails to quit trying. Another could have its application time lapse, before successfully passing the state licensure test. These occurrences are dropout channels for qualified candidates, are not accounted for. What it is public record, again, is the number of licensees, so the number of successful qualified candidates passing the state licensure test published by the Florida Department of Business and Professional Regulation Bureau of Education and testing on its website.

While a plethora of web sites comment on these low passing rates little or nothing has been investigated or described at the scholarly level (Brown-Climer, 2017; Lofton, 2017). In fact, most of the published articles dealing with education and Florida Real Estate licensees are at least a decade or two old. Brown (2016) reviewed the educational requirement for Real Estate licensure. Additionally, Brown (2016) underscored the benefits provided by better education and the added value related to a firm's earning potential. In their article, Brown describes the Most Rapid Approach Model (M.R.A.M.) where an individual manages to earn its license and meet the minimum legal requirement to safely practice, while still having room to maximize the quality of the services offered to the public, and it's earning potentials.

Similarly, McHugh (2014) analyzing the 2013 NAR member profile identified a correlation between REALTOR ® education and earning potentials. Feeding on a NAR statistics, rather than on a state-run census,

the study by McHugh is limited as it systematically disregards all the licensees working for commercial firms not joining the respective local board of REALTORS, or the residential firms not joining the board by choice. On the other hand, McHugh describes the reasons for the correlation between the highest level of production, at least for the year 2013, and the individual achievement in post-graduate education.

Similar conclusions were obtained by a study performed by Hull (2018). Hull observed an additional 6% average income for real estate agents having at least an associate degree more than other having lower qualifications, real estate agents having at least a Bachelor's degree earn at least 12% more than other having lower formal qualifications, and real estate agents having a graduate degree earn at least 23% more than others having lower qualifications (Hull, 2018). If education, as it seems, is a predictor of an agent's future earnings one would wonder why are the passing rates at the state test relatively low. Another reason of concern consists in the existence of several more dropout channels in the path to Florida Real Estate licensure not addressed or accounted for. One of the goals of the present writing is to show, out of total population of Real Estate aspirants making a formal move (literally spend some money) to earn a Real Estate license in Florida: several are left without even the possibility to become eligible applicant.

1.5 Role of Virtual Support Groups

Florida real Estate School are entities licensed by the D.B.P.R. and may include proprietary schools, colleges, universities, and career centers. For a proprietary school, establishing a good reputation improves substantially the chances of survival in a competitive market. One way to establish a good reputation is to maximize overall students' pass rate (Membrillo, 2017). 61J2-17.013(1), F.A.C. prohibits schools to guarantee success of a pupil taking the state licensure exam, still school instructors and administrative personnel would want to maximize the practical chances for a students to succeed academically (Collins, 2018; Crawford, 2017) . Assuming that the classroom time is fruitfully spent working on the teaching material, one way to increase pass rate then is to provide support outside the classroom. With the advent of technology, support outside the classroom can be done by establishing virtual support groups where students, instructors, and school administrators can interact on topics related to the Florida Real Estate licensing process (Ferrone, Kebodeaux, Fitzgerald, & Holle, ,2017; King, Tee, Falconer, Angell, Holley, & Mills, 2018; Toppin & Toppin, 2016).

A virtual community is a network of individuals interacting via some sort of software or other synchronous or asynchronous method of communication (Beckert, n.d.). Because of the broad definition of a virtual community, its component may be local, or may be geographically distributed across vast regions. Chat rooms, personal instant messenger communications, and other forms of interactions that do not have, at least on their face, some form of permanent character would not be included into the accepted definition of virtual community. One of the constraints of a virtual community consists in sharing some common interest. Ridings and Gefen (2004) analyzed the reasons why individuals join virtual communities. They recognize the important role played by the general human need for interaction.

1.5.1 Virtual Support In Education

With the advance in communication, people found several applications for virtual communities (Ye, Feng & Choi, 2015). There are several kinds of support that virtual communities can provide. Virtual health communities allow their participants to share experiences on their conditions (Zigron & Bronstein, 2018). Mental health professionals may use virtual communities to investigate vulnerable categories of individuals while maintaining their privacy (Heyes, 2017). Finally, Pan et al. (2015) show how virtual communities are used to boost learning. Bernet and D'Arcy (2018) provided an example of virtual training for Real Estate agents. By adapting "the Blue Game" a game developed in 2012 as a part of a Master Thesis at the Heney Business School of the University of Readings (UK), Bernet and D'Arcy provided a tool for real estate agents to practice different scenarios focused in solving hypothetical dilemmas of Real Estate investors.

Different studies (Wellman & Gulia, 2018; McLoughlin, et al., 2017) point out the growing trend of looking at education as a virtual community rather than a physical place. Wellman and Gulia (2018) found the theoretical framework in the debate between *presentist* and *unscholarly*. Sociologists pointed out the place-oriented nature of communities, while in a network dominated cyber space the physical location loose its intrinsic meaning. Wellman and Gulia (2018) performed a qualitative investigation describing in detail the interaction within virtual communities since the nineties. Significant aspects of the qualitative analysis by Wellman and Gulia (2018) include whether online communities are narrowly specialized, what are the positive aspects of the ties between people build in an online environment, whether there is reciprocity or attachment to and from an online community.

While very few ethnographic studies have been published with respect of online communities, Wellman and Gulia (2018), triangulated the information available in the literature with their own environmental observations. If strong or intimate ties could be established in an online environment, how a virtual community could affect the real life of the individuals, whether or not there is diversity in virtual communities and if virtual communities could be compared or related to real communities. Wellman and Gulia (2018) specifically pointed out one of the

implicit aspects of operating in a virtual environment is the feeling of emotional support, lacking in a real-life environment. In other words, one of the driving forces of virtual communities, is because participants actually feel part of a group, while enjoying the benefit of anonymity.

On the other hand, a textual analysis performed by Wellman and Gulia on 24,237 topic-oriented discussion groups reveals the similarities between the interactions formed online and real life interactions. Virtual community then, despite the lack of a physical location, can play very important roles as providers of academic information and support. McLoughlin et al. (2017) take a different approach by analyzing the growing importance of virtual communities in professional education. McLoughlin et al. review 19 peer reviewed studies indicating the importance of virtual interactions is not only emotional, rather fulfills the need for an effective interaction at the time when is needed. The 19 peer reviewed studies analyzed by McLoughlin et al. were returned from a PubMed and Google Scholar search for a combination of relevant keywords. Depending on the nature of the community different infrastructures were observed. For example, the popularity of the Meta Inc. (*Facebook*) was attributed to the ability of organizations of promoting themselves among the general population. *Twitter* was noticed to appeal to people looking for an instant or immediate feedback in the form of a "*Tweet*". Aside from the infrastructure chosen virtual communities can provide an interactive forum for researchers to interact in a protected environment that can be adapted, shaped, or customized in function of the needs of the community.

Lygidakis & McLoughlin (2016), for example, focus on the benefits of virtual communities in primary care education. One of the fields indicated by McLoughlin et al. as potential application of virtual communities for continuing and professional education. Overall Wellman & Gulia (2018), and McLoughlin et al. (2018) highlights two different, but important, aspects of the inquiry developed in the present investigation: a virtual community not only is effective because of its ability to provide valuable technical information in a minimal amount of time but enhances students' motivations and aspirations.

1.5.2 Applications of virtual support in adult education

Applications of virtual communities in education include the medical and allied sciences field (Raiman, Antbring, & Mahmood, 2017; Giordano, Koch, Godoy-Santos, Belangero, Pires, Labronici, 2017), include teaching foreign languages (Baek, Yoo, Lee, Jung & Baek, 2017; Jin & Zhirui, 2017), and include the construction industry (Li, 2015). The different applications of virtual communities in education provide a solid basis for the efficacy of the applications. Raiman et al. presents a study performed on 19 medical students in a problem-based learning (PBL) environment, where the student, when challenged could access real time support from its peers and mentor. Farmer, Liu & Dotson, (2016) suggest, for a rural context, where the availability of information is limited, and not everyone has access to some form of education, instant communicators may make the difference by providing a pathway for educational solutions to be delivered to the end user.

Giordano et al. (2017) present a comprehensive and systematic review of the utilization of WhatsApp as telemedicine tool. In a review of 30 studies published in peer review journals, evidences were observed of the robustness of the WhatsApp application (Giordano et al., 2017). For example, users find the ability of sharing multimedia files with WhatsApp is better than most, if not all, other communication software. The role of WhatsApp as a leader in the virtual community arena is not only pointed out by Giordano et al. but by Raiman et al. (2017), and by Bouhnik & Deshen, (2014). Based on the three studies indicated above one can make a strong case: not only virtual communities can be a support tool for community and professional education, but WhatsApp is the most effective software program to provide support. The support provided in the studies are not necessarily limited to the transfer of information intended in the pedagogical sense, rather it encompasses a broader range of topics ranging from troubleshooting simple practical problems, to providing inspiration and motivation.

Ahad & Lim (2014) on the other hand, raised the question as to whether WhatsApp is an asset or a liability in an educational institution. In a study involving 158 undergraduate students, Ahad & Lim described participants using WhatsApp less than 50% of the time for educational related tasks. The study participants would often install other instant messenger applications on phones in addition to WhatsApp: lowering even more, the percentage of use dedicated to educational purposes. Ha, Joa, Gabay, & Kim, (2016) pointed out how the use of WhatsApp could steer away students from using institutional methods of communications such as the college's email. Ha, et al. (2016) creates doubts and uncertainties in the world of higher education as it could favor uncontrolled forms of communications, such as phishing scams, or fake news: eventually defeating its alleged effectiveness.

Unlike other studies (Farmer, Liu & Dotson, 2016), Yeboah, and Ewur (2014) analyzed the effect of the introduction of the instant communicator Wattsapp on students attending tertiary educational institutions in rural communities in Ghana. Despite an initial skepticism, in their analysis Yeboah, and Ewur (2014) observed as the unsupervised introduction of an instant communicator may create more harm than good, quickly becoming a source of distraction for the students. While overall it is difficult to draw a balance between the beneficial and the negative aspects of the introduction of a virtual communicator for the delivery of educational support, it

almost seems its efficacy strongly depends on the strategy used to propose to the students. If, in fact the presence of the instant communicator is merely tolerated, and seen as a distraction, the integration of said technology in education is likely to become hindered by different kinds of distracting messages. On the other hand, if the education is delivered via the instant communicator and proper channels are opened for the specific support purpose, the instant communicator may become an invaluable tool as described by Raiman, et al (2017).

Wellman and Gulia (2018) analyzed the role of virtual communities by performing a literature review addressing seven separate research questions directed to clarify the nature of interactions in virtual communities. Raiman, Antbring and Mahmood (2017) performed an experimental quantitative investigation on 6 WhatsApp Messenger groups created to support medical students during their clinical. The virtual groups were observed for a period of eight weeks and a thematic analysis of their communication was developed. The findings of the study by Rainman et al. (2017) indicate a wide societal acceptance of WhatsApp and the feasibility for it deployment in the educational arena. According to Lucey (2015), enjoying wide societal recognition, it is one of the characteristics needed to make a distance instruction (DI) tool effective.

Giordano et al. (2017) present a literature review of studies directed to applications of the instant communicator WhatsApp to telemedicine. After a keyword search was performed, Giordano et al. identify thirty studies examining potential applications of WhatsApp. After extracting data, including the original language of the article, the country where the study was performed, the type of participants, the medical specialty considered, the mean age of the participants, and any problem observed, the studies were classified according to the Oxford level of evidence, and qualitatively analyzed. Finally, Yeboah & Ewur (2014) performed a survey of 50 students from tertiary education institutions on the effectiveness of WhatsApp as instant communicator and triangulated their experimental observations with archival data and other environmental observations. Yeboah & Ewur tailored their investigation in a qualitative fashion to fulfill research needs. By matching the different kinds of observations Yeboah & Ewur seem to suggest some duality in the introduction of WhatsApp as teaching tool. While WhatsApp can in fact transmit knowledge faster, it is not selective and it is prone to be used for distraction, rather than strictly for educational purposes.

1.6 Gap in the literature

There is an apparent gap in the current literature. Multiple scholars focused their attention on application of virtual support for different educational settings (Raiman, Antbring & Mahmood, 2017; Giordano, Koch, Godoy-Santos, Belangero, Pires, Labronici, 2017; Baek, Yoo, Lee, Jung & Baek, 2017; Jin & Zhirui, 2017; Li, 2015). The legal and educational framework for the Real Estate licensing process in the state of Florida is extremely well articulated (Crawford, 2017; Collins, 2018). On the other hand, after having carefully considered the available literature in the manner described, there is no known study which measures the effectiveness of virtual support on real estate students in general, and Florida real estate students in particular. Research is necessary because unless some corrective action is taken, a huge waste of resources, including time, money, and effort, may continue to happen unless the problem is addressed. The gap in the literature is evident, since while interest has been shown on the topic of virtual communities, no or little focus has been placed on Florida real estate aspirants for licensure.

2. Methodology

The purpose of the quantitative ex post facto study is to analyze the effectiveness of virtual support groups on community and professional education classes in general, and on Florida real estate pre-licensure classes in particular. To fulfill the purposes stated above the present investigation will address the following research questions:

Research question (1): “Is there a correlation between students’ involvement in a virtual support group (independent variable) influence the time it takes for a student to pass the state test for real estate licensure (dependent variable)?”

Research question (2): “Is the correlation between students’ involvement in a virtual support group (independent variable) and the time needed for a student to pass the state test for real estate licensure (dependent variable), if any, positive, or negative?”

And: Research question (3): “Is the average time (dependent variable) calculated as the difference between the certificate date and the licensure date affected by the students’ participation in a virtual support group (independent variable)?”

The three research questions are quantitative in nature and the respective answers must be developed applying appropriate statistical techniques. The operative definition of target population is formalized as ”the group qualified applicants sitting for the Florida real estate licensure test in the ten quarters between Q(4) 2015 and Q(1) 2018 residing in Miami Dade County, Fl” and is estimated to be in the 50,000 individuals. The sampling scheme is a convenience sampling scheme clustered in the different classes thought in the ten calendar quarters under analysis. The intervention consisted in asking the students for their voluntarily participation in a

WhatsApp based virtual support group. Over the ten quarters in between Q(4) 2015, included, and Q(1) 2018, included, students enrolling in pre-licensing courses at the school where randomly assigned into two groups, without any particular basis. One group, consisting in the experiment group, was supported by continuous communication via the mobile application WhatsApp. One group consisting in the control group was not virtually supported. The data were collected ex post facto and the informed consent was a condition precedent their usage.

2.1 Research design and rationale

Archival quantitative data in the form of student enrollment, pre-licensing course completions, and licensure date were collected from different sources. Student enrollment in Florida Real Estate pre-licensing courses, and pre-licensing courses completion data were collected from a small proprietary school located in Miami Dade County, Fl. The data were collected on an Axisbase 1 database (Divergentlabs, 2011). License application, and licensure data were collected from public record. The Florida Open Meeting Law, Fla. Stat. §286 and the Florida Public Record Law Fla. Stat. §119, collectively referred as the Florida Sunshine Laws allow the public to access a broad variety of documents filed with the state government including the roster of the Real Estate applicants for licensure, and the roster of the Real Estate licensees.

Public record data were collected for a period of time ranging in between the third quarter of 2015 and the fourth quarter of the calendar year 2018. Enrollment data and students' course completion data collected from the school were also analyzed to determine how much time it would take for a student to earn a Real Estate license after completing the required pre-licensing course under rule 61-J2-3.008 of the Florida Administrative Code.

The ex post facto research design was introduced in 1973 by Lord as a research methodology for educational settings (Amelec & Carmen, 2015; Ernst & Williams, 2014; Lord, 1973). The elements of the ex post facto method include: (1) defining the problem, (2) a comprehensive survey the literature, (3) the formulation of the hypotheses, (4) The description of the assumptions on which the hypotheses and the experimental procedures rely, (5) designing a proper approach accordingly, (6) the validation the data gathering techniques, (7) describe, analyze, and interpret the findings of the investigation, and (8) reporting the findings in a clear, sucking, and not misleading form.

The ex post facto method established itself over time as a convenient approach to analyze facts happened in the past and provide further elaboration under the light of new findings, such as novel statistical or analytical tools. In recent years different investigators (Amelec & Carmen, 2015; Ernst & Williams, 2014) utilized the ex post facto design to investigate educational topics. Because of the robustness of the ex post facto research design, and because of the availability of data through the Florida public record system the ex post facto design was found to be the most appropriate design for the present investigation.

In Florida the state licensure exam score for passing students is maintained confidential. Therefore, comparing the average scores at state licensing examinations would have been impractical, or better impossible. Licensure time was chosen as dependent variable instead. Licensure time is not necessarily a common indicator of effectiveness in the field of professional examinations. In general, most of the literature on indicators of success for educational programs comes from nursing practice (Brooks, 2015; Lavandera et al., 2011). In nursing practice, the first attempt pass rate is used as an indicator of success in a pre-licensing educational program. On the other hand, because of the complexity of the Florida Real Estate application process, and because of the potential impossibility of tracking the first attempt pass rate for qualified Real Estate applicants, the average licensure time was chosen as the dependent variable.

2.2 Population selection

The present investigation examined students and licensees' records over a period of ten calendar quarters from Q(4) 2015 to Q(1) 2018. During the period of time from Q(4) 2015 to Q(1) 2018, about 5,500 qualified applicants attempted the state licensure test for Florida Real Estate sales associate each month, and about 500 applicants attempted the state licensure test for Florida Real Estate broker on a monthly basis. In an ideal case the population of the study is the bulk of Florida real estate qualified applicants. There are different constraints and limitations shaping the target population from a broader concept to a realistic estimate. For example, there is a temporal limitation.

If we start from the broad concept: a population is the complete collection of all individuals to be studies (Triola, 2010), one could virtually have an infinite population, without geographical or temporal limitations. One approach to limiting a population to recognize some common traits of its individuals (Eldredge, Weagel & Kroth, 2014). Since the attitudes of individuals toward technology change rapidly, the population of the present study is limited in time to the Florida real estate qualified applicants taking the state licensure test in the ten calendar quarters under examination, in between Q(4) 2015, and Q(1) 2018. The population of Florida real estate qualified applicants taking the state licensure test in the ten calendar quarters under examination, in between Q(4)

2015, and Q(1) 2018 amounts to approximately 150,000 individuals.

An additional constraint is the geographic location (Banerjee & Chaudhury, 2010). Virtually the 150,000 qualified applicants sitting for the Florida real estate licensure test in the ten quarters between Q(4) 2015 and Q(1) 2018 may have any geographical distribution. Establishing a claim of a statewide distributed population would not be realistic too. Therefore, the target population was further limited to the population of qualified applicants for Florida real estate licensure resigning in Miami Dade County, Fl.

While an exact count of the qualified applicant for Florida real estate licensure resigning in Miami Dade County, Fl in between Q(4) 2015 and Q(1) 2018 is extremely labor intensive, since about one third of the Florida real estate licensees generally resides in Miami Dade County. The assumption underling the present investigation was, therefore, a target population of about 50,000 individuals. In conclusion, the operating definition of the target population of the present investigation is composed by the qualified applicants sitting for the Florida real estate licensure test in the ten quarters between Q(4) 2015 and Q(1) 2018 residing in Miami Dade County, Fl.

2.2.1 Sample selection

The ex post facto research design is a *quasi*-experimental design where there was no randomization of the sample (Trochim & Donnelly, 2005), rather the sample is a convenience sample. The sample was clustered where every cluster represents a different class or group of students (Triola, 2010). Some student-participants in some classes joined in a WhatsApp support group: these students formed the experiment group. Some student-participants were not provided with such a support, these students formed the control group. The sum of the experiment and the control group represent the sample.

The researcher was very aware of the limited external validity associated with convenience sampling (Triola, 2010; Trochim & Donnelly, 2005; Johnson & Christensen, 2008). Because of the geographical limitations of the researcher, and because the majority of the studies in quantitative educational research are based on a similar sampling scheme (Johnson & Christensen, 2008), including specific virtual support studies (Baek, Yoo, Lee, Jung & Baek, 2017; Giordano, Koch, Godoy-Santos, Belangero, Pires & Labronici, 2017; Raiman, Antbring & Mahmood, 2017), the convenient sampling strategy of the present investigation was deemed appropriate. In a study in which the exact extent of the population is known, sample size is calculated as a percentage of the target population. On the other hand, the data on the magnitude of the population of Florida real estate aspirants are not certain since they vary substantially as a function of various unrelated parameters such as geographical distribution, situation of the general economy, and age and level of education of the participants. Therefore, there is no simple way to determine a numerical value for the size of the population.

In general Equation (1) is used to estimate sample size (n) in a case like the one described, where the population size is unknown, but the confidence interval can be built around some expected results:

$$n= [z(_{\alpha/2})]^2 *p(s)*q(s)* E^{-2} \qquad \text{(Equation 1)}$$

In equation (1) p(s) is the sample proportion, q(s)=1-p(s), E is the margin of error and $z(_{\alpha/2})$ is the critical value for a confidence level chosen by the researcher (Triola, 2006). For a .90 confidence level, $z(_{\alpha/2})$=1.645, for a .95 confidence level, $z(_{\alpha/2})$=1.96, and for .99 confidence level, $z(_{\alpha/2})$=2.575.

The confidence level represents the expectation on which the confidence interval includes the desired scores. By using a $z(_{\alpha/2})$=1.96 in the calculation, the investigator has 95% confidence on the true value of the population being included within the selected confidence level built around the sample. Substituting numerical values for a 99% confidence level and a confidence interval ranging from .3 to .8 a minimum sample size of 24 is obtained: n=24 is then used as lower limit for the present investigation: using a larger sample increases the goodness of the observation, without jeopardizing its rigor. Participants were approached during the registration period, and they were asking whether they had access to instant communicator WhatsApp or not, if they were willing to install the software application on their phones to receive class updates and share course relevant information, and if they were interested in participating in the intervention, or not.

Before carrying on the study, all the participants were presented with an informed consent. The succession of events caused the investigator to qualify the present study as an ex post facto. The participants were asked to sign off the form and return the signed form either via personal delivery, fax, email, or regular post. Only the data of the students with an informed consent on file were considered in the study. The informed consent was used as screening tool within the sample: students showing interest in participating in the study were randomly assigned either to the experiment or control group. Randomization within each cluster of participants was realized using a web-based randomizing tool (random.org, n.d.)

2.2.2 Instrumentation

The data collected, namely the certificate date and the licensure date, were organized per quarter into two groups: an experiment group and a control group, then the identity of the participants was severed. The database was then duplicated: the original database containing the names of the students was stored in a separate USB drive in a password protected file and deposited in a safe. At the passing of the third-year anniversary of the publication of the research is scheduled to be destroyed. The duplicate database is removed of the names and saved on a

laptop for use. The names are replaced with alpha numerical indicators (*student number 1*, *student number 2*, *student number 3*…and the like) to maintain the anonymity of the participants (N.I.H., n.d.).

The difference between the certificate date and the licensure date was calculated in Julian days. A first screening of potential differences in the groups was done by performing the analysis of the variance ANOVA (Trochim & Donnelly, 2005) over the different groups: sales associate experiment, sales associate control, broker experiment, broker control. Verifying the homogeneity of the variance was a critical step in performing the ANOVA (Box, 1953). On the other hand, for sufficiently large samples like in the present investigation, the homogeneity of the variance does not necessarily affect the conclusions drafted with the analysis of the variance (Layard, 1973; Sen & Singer, 2017).

The difference between each group were then analyzed with the *t*-student test. The student t-test was developed by William Sealy Gosset (Student, 1908) who first published his findings in a paper titled "*The Probable Error of a Mean*" under the pseudonym Student. The *t*-student test was developed to ascertain whether the difference between two distributions was statistically significant, or not. One of the assumptions of the *t*-student test is: "*the number of data points is less than optimal, less than 30*". Therefore, there is the need to estimate the error of the mean for both the distributions under examination.

The null hypothesis (H_0) implies no difference between the mean licensure time for the experimental and control groups. $\mu_1=\mu_2$ or $\mu_1-\mu_2=0$. The alternate hypothesis H_1 is supports a statistically significant difference in between the two groups therefore $\mu_1\neq\mu_2$ or $\mu_1-\mu_2\neq0$. Then a confidence interval was established at 5%. The 5% value of the confidence interval implies a high (95%) probability of being close to the true value. Once the two distributions to be compared are tabulated and the number of data point for each one is counted, the determination of the degrees of freedom is done.

The degrees of freedom are calculated by summing the number of data point in each distribution and subtracting 2 or one from each group. The next step is to calculate the means and the standard deviations for each distribution. The value of the t variable is then calculated as the difference of the two means divided by the standard error of the difference between the means (Trochin, 2006).

$$t= (\bar{x}_1 - \bar{x}_2) * ([\sigma_1^2/n_1]+[\sigma_2^2/n_2])^{-0.5} \qquad \text{(Equation 2)}$$

Data elaboration was performed with R (R Core Team, 2022).

3 Results and Discussion

Raiman, Antbring & Mahmood (2017) describe in detail the use of the instant communicator WhattsApp in the field of medical education. The intervention of the present investigation, similarly to the one of Raiman, Antbring & Mahmood, does not follow a predetermined protocol, rather builds on the opportunity to give the students the ability to interact when facing a real-life problem such as earning a real estate license. In the present study the treatment was a virtual support activity articulated for approximately the length of the course of study, six weeks, and for three weeks thereafter, for a total of nine weeks. The opening message consisted in a welcome message with specific links to statutory reference materials such as the Florida Real Estate Commission (FREC) Syllabus (FREC, 2015; FREC, 2017), or the state published Candidate Information Booklet (DBPR, 2017).

Examples of instant messages delivered by the instructor via WhatsApp included clarification on application procedures or exam topics, reminders about important state mandated deadlines, and updates on regulatory material. For example, a typical message would follow up on classroom discussion and read like: "*As the week-end approaches its end, I thought it was important to remind you that under FS 475.161 a broker associate or a sales associate, but not an active broker, can register as an individual, as a professional association (P.A.), as a limited liability company (L.L.C.), or (new), as a professional limited liability company (P.L.L.C.). Because under the statute a broker can only register as an individual, when you decide to activate your newly earned broker license you will have to decide how to ultimately dispose of the old corporate entity used as a shell for your license during your sales associates years*".

Another example of an instructor originated message following up a question and answer session would read: "*Great session last night with Rick and David. One important but obscure topic we analyzed together was the relevance of FS 163.3161 also known as the Community Planning Act or, shorthanded, CPA. The act should be covered in Chapter16 of the January 2017 FREC II Syllabus, and effectively transfer to local governments the powers and responsibilities to implement comprehensive planning programs to encourage the most appropriate use of the land. The statute is available on line for your consultation at: http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0100-0199/0163/Sections/0163.3161.html*".

Students would contribute to the discussion, with announcement, notifications, or request for clarification. For example one student would request the cancelation of a class meeting texting the following message: "*All!! Just got a call this morning for a 2nd showing at 4 PM of $2.6M house. If wife likes it, my client's gonna buy it. If that's the case, im gonna have to write offer & miss class. Any chance to skip today & go straight to weds?*" The group agreed to her request. Just as in Raiman, Antbring & Mahmood (2017) then the instant communicator had

both practical and technical questions were addressed either in a cooperative learning, or instructor lead contexts.

Because of the dichotomous nature of the study, the students either participated in the treatment or not, a correlational analysis was not found appropriate. The students were contacted at least on a weekly basis by the instructor with messages or inputs of different kind, including reminders of important deadlines, useful exam information, and latest statistics releases. The students were left the decision of how often communicate via the instant communicator, and they could choose the contents of the messages they were originating. The treatment lasted often about six weeks: class time, usually four weeks, and two more weeks.

3.1 Data collection

Licensure dates of licensees were collected from public record at myfloridalicense.com. The certificate dates were collected from school records. The entries were collected on a table using a word processor and organized in a four-columns table including: name, certificate date, licensure date, license kind. The table was not printed but rather password protected saved on a USB drive. A copy of the table was then saved on a working laptop and modified to eliminate the column with the students' names.

Eliminated the column bearing the students' names space opened for a fourth column. A fourth column was added on the right end side of the right end side of the table and filled with the difference, calculated in Julian days between the certificate date and the licensure date. The USB with the file bearing the personally identifiable information of the students was stored in a safe under lock.

3.1.1 Data preparation

A table was generated on a word processor organized in four columns reporting namely the certificate date, the licensure date, the type of license, and the difference in Julian days between the licensure date and the certificate date. In some cases, when the student did not get its license within the ten calendar quarters under examination, the licensure date was left empty and the data point was filled out with 730 days. In some instances, it was observed that students in fact obtained their license several weeks, months, years, from the end of the present investigations. Other students never ended up in getting licensed underscoring the high rate of Florida real estate licensure aspirants dropout (D'Ottone, 2019) and are subject of a separate investigation ancillary to the present study. The data, in their final formatted form, are reported in Table 3.

3.1.2 Data analysis

Data analysis was performed with R (R core team, 2022). The differences between the certificate date and the licensure date were classified according to the kind of license in two different groups: the sales associate group and the broker group. By organizing the data in the way described above, four separate groups were created, respectively: sales associate experimental group (n=12), sales associate control group (n=72), broker experimental group (n=19), and broker control group (n=37). The data are tabulated in Table 3. To ascertain whether any significant difference was present among the four groups the ANOVA analysis was performed (Trochim & Donnelly, 2005).

As a preliminary step for the ANOVA the researchers had to verify the homogeneity of the variance. For large groups (n>20) the variances are homogeneous, and ANOVA is a proper analytical tool (Layard, 1973; Sen & Singer, 2017). Finally, any statistically significant difference in between each group was analyzed with the *t*-student test (Trochin & Donnelly, 2005). The analytical protocol described above is consistent with current ex post facto research designs (Ary, Jacobs, Irvine & Walker, 2018). Ex post facto research designs were formalized in the sixties (Lord, 1973) acknowledging the need to analyze large amount of data, already present in the literature, in a way to highlight correlations and discrepancies.

There are different research designs applicable in a *quasi*-experimental investigation (Lord, 1973; Montero & Leon, 2006), although for quantitative studies where information originating from multiple data sources needs to be compared, the ANOVA analysis is the most appropriate. The ANOVA test performed over the totality of the data in table 2 produced results indicating a statistically significant difference between the groups p=1.721>0.005. Therefore, further analysis must be performed to identify the differences between the groups. *t*-tests were individually performed to evaluate the statistical significances of the experiment and control group for sales associate and broker data. For sales associates the average licensure time was 565 days for the control group and 501 for the experiment group. The p value for the *t*-test performed to compare the sales associates experiment and control group was 0.5129>0.05 indicating a statistically significant difference between the groups. For brokers the average licensure time was 567 days for the control group and 416 for the experiment group. The p value for the *t*-test performed to compare the broker experiment and control group was 0.077>0.05 indicating a statistically significant difference between the groups.

3.1.3 Reliability

Reliability was addressed in two ways: primarily by comparing the average licensure time for the Florida Real Estate sales associates and the Florida Real Estate broker students. Using two separate datasets in parallel ensured the reproducibility of the study (Heale & Twycross, 2015). Test-retest reliability would not be applicable for this kind of study, since an individual only gets licensed once in its lifetime. Inter-rater reliability would be

an object of a separate study. Noble and Smith (2015) addressed the issue of reliability for qualitative studies basically splitting the issue in two components: consistency related to the trustworthiness of the qualitative methodology, and neutrality, or confirmability, related to possible bias introduced by the methodology used. There are considerations that were kept in account in the qualitative part of the study.

4 Conclusions

Looking back at the research questions, the experimental observations described and analyzed in the present study support the following answers: Research question (1): "Is there a correlation between students' involvement in a virtual support group (independent variable) influence the time it takes for a student to pass the state test for real estate licensure (dependent variable)?"

Answer: Yes: both in the sales associate and in the broker group a t-student test showed that there is a statistically significant difference between the licensure time calculated as the difference between the exam date of the pre-licensing course and the licensure date.

Research question (2): "Is the correlation between students' involvement in a virtual support group (independent variable) and the time needed for a student to pass the state test for real estate licensure (dependent variable), if any, positive, or negative?"

Answer: A comparison of the average licensure times calculated as described above both for the sales associate and the control group shows that there is a negative correlation between the licensure time and the support. If virtual support is provided the licensure time is shortened.

And: Research question (3): "Is the average time (dependent variable) calculated as the difference between the certificate date and the licensure date affected by the students' participation in a virtual support group (independent variable)?" Answer: Yes (see supra).

Overall, the observations collected during the present investigation seem to support the position of Giordano et al. (2017), Raiman et al. (2017), and by Bouhnik & Deshen, (2014) that ultimately value WhatsApp as a teaching and learning tool. This study only tested virtual support delivered by WhatsApp on students-participants in live classroom. It did not address students taking their pre-licensing course over the internet either in videoconference or distance learning. Studies developed in the post COVID-19 era support the application of Blended Synchronous Learning (BSL) to facilitate property leaching and learning (Cheung, and Wu, 2023).

Future developments of the present study include the exploration of the legal implications of motivating students through an app such as WhatsApp. For example, if a school sends a text or a WhatsApp message to a student and the student decides to open the message while driving: would the school bear any liability? In addition to that, there are context where education is not always duly supported or promoted: a further development of this study is to explore the applicability of these techniques to increase the level of education of underprivileged students living in such as contexts.

4.1 Ethical considerations

The study of the present investigation is directed to: "*Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.",* and it is therefore considered exempt from the requirements of 45 CFR Public Welfare under 45 CFR 46.101 (b) (1).

When developing the protocol for the investigation, differentiating the experiment and control group, the researcher ensured that participants were fully aware about the possible consequences of being in one or the other group. The confidentiality of their information, other than what constitutes public record, was ensured by severing personal identifiable information, from the data file at an early stage of the research. Finally, in any published work no mention was made of the institution where the research was conducted, rather a generic term as used such as *"…a proprietary school in Southeast Florida*" (APA, 2010).

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Table 1. Elements of Transactional Leadership (Burns, 1998).

Transactional Leadership
Clear Objectives
Respect for Organizational Culture
Immediate Reward

Table 2. Florida Real Estate State licensure test data respectively for the Sales Associate and for the Broker exams for the fourth quarter 2015, for the entire year 2016, for the entire year 2017, and for the first quarter 2018 (Bureau of Education and Testing, 2017).

Florida ***Sales***		**Real** ***Associate***	**Estate**	**Exam**	**Performance** ***Broker***	
Pass	Fail	Total		Pass	Fail	Total
			2015			
2,640	3,582	6,222	*Sep-15*	231	257	488
2,797	3,679	6,476	*Oct-15*	221	249	470
2,248	2,938	5,186	*Nov-15*	259	243	502
2,333	2,970	5,303	*Dec-15*	232	233	465
1,878	2,628	4,506	*Jan-16*	165	168	333
2,290	2,945	5,235	*Feb-16*	158	190	348
2,551	3,390	5,941	*Mar-16*	209	190	309
2,457	3,374	5,831	*Apr-16*	188	228	416
2,472	3,269	5,741	*May-16*	183	224	407
2,597	3,425	6,022	*Jun-16*	209	227	436
2,284	3,193	5,477	*Jul-16*	158	182	340
2,803	3,699	6,502	*Aug-16*	239	245	484
2,273	3,214	5,487	*Sep-16*	210	235	445
2,271	2,917	5,188	*Oct-16*	197	241	438
2,102	3,032	5,134	*Nov-16*	211	275	486
1,953	2,830	4,783	*Dec-16*	208	248	456
1,697	2,547	4,244	*Jan-17*	138	192	330
2,059	2,682	4,741	*Feb-17*	178	184	362
2,345	3,224	5,569	*Mar-17*	251	247	498
2,165	3,199	5,364	*Apr-17*	171	222	393
2,479	3,314	5,793	*May-17*	241	231	472
2,526	3,312	5,838	*Jun-17*	208	193	401
2,265	3,263	5,528	*Jul-17*	205	199	404
3,015	4,233	7,248	*Aug-17*	268	231	499
1,561	2,344	3,905	*Sep-17*	159	151	310
2,317	3,365	5,682	*Oct-17*	237	192	429
2,068	3,194	5,262	*Nov-17*	247	189	436
2,317	3,365	5,682	*Dec-17*	237	192	429
1,850	3,038	4,888	*Jan-18*	185	164	349
2,124	3,139	5,263	*Feb-18*	188	184	372
2,118	3,344	5,662	*Mar-18*	256	198	454

Table 3. Days between the passing of the end of the course examination (certificate day) and the state licensure date. For students that did not get ultimately licensed within a two-year period the number 730 days was used. The students belonging to the experiment group were assisted with virtual support either by text messages or by WhatsApp. Students belonging to the control group were not assisted by virtual support.

Sales Associate Control Group	*Sales Associate* Control Group	*Sales Associate* Experiment Group	*Broker* Control Group	*Broker* Experiment Group
724	26	30	108	307
730	730	730	150	307
139	96	730	730	213
730	730	730	730	730
730	730	730	730	730
730	730	730	730	730
730	730	730	436	29
730	730	82	730	730
58	190	730	730	643
127	158	56	730	46
380	730	539	730	730
730	730	200	160	365
730	730	-	730	49
101	54	-	730	39
730	42	-	730	38
730	730	-	371	33
730	49	-	730	730
730	51	-	730	730
730	280	-	730	730
730	324	-	81	-
120	730	-	730	-
295	730	-	250	-
730	730	-	730	-
730	72	-	730	-
188	730	-	730	-
730	730	-	318	-
730	730	-	730	-
730	730	-	730	-
730	730	-	730	-
729	730	-	47	-
730	730	-	730	-
730	730	-	68	-
74	642	-	730	-
730	730	-	730	-
730	730	-	401	-
730	-	-	730	-
730	-	-	365	-

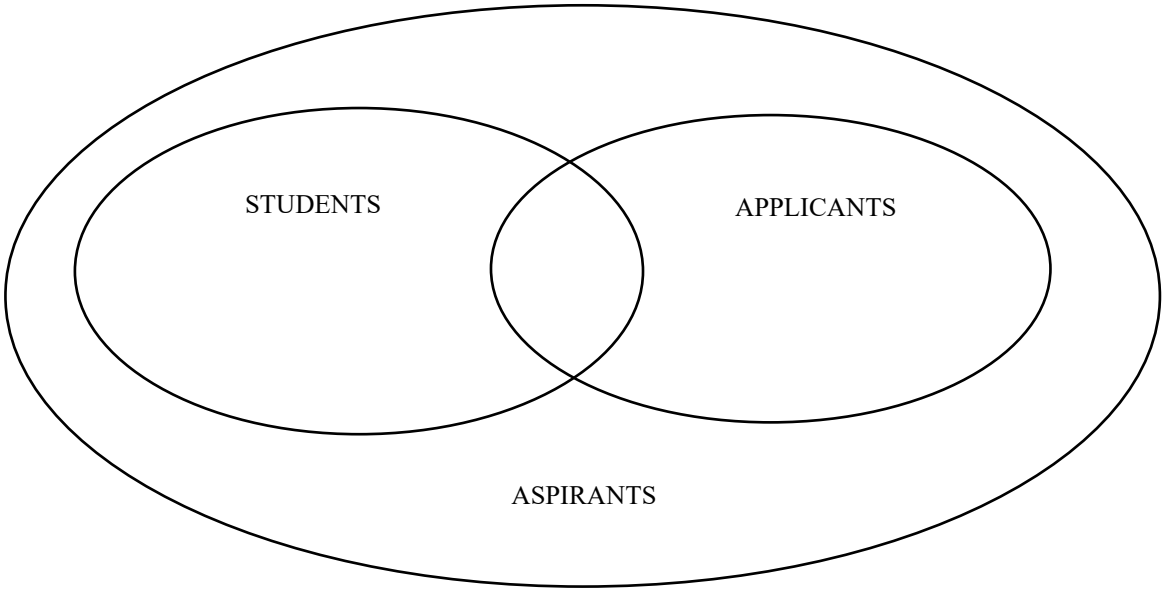

Figure 1. Venn diagram illustrating the relationship between the terms of aspirant, applicant, and student, as used in the present study.

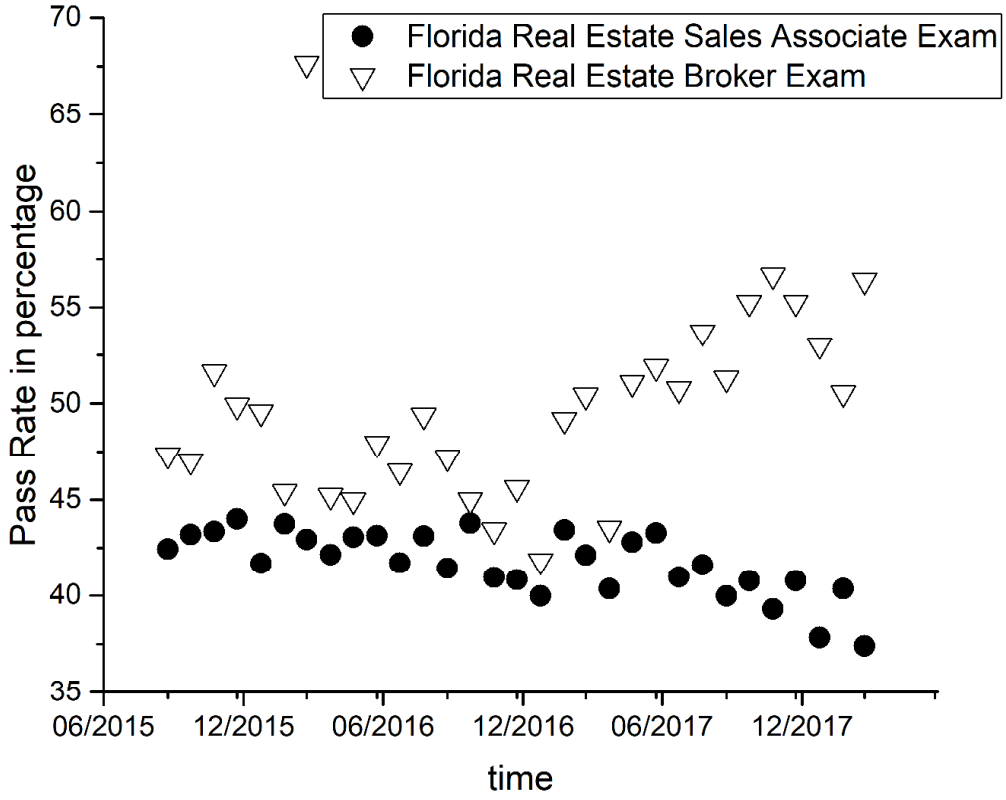

Figure 2. Florida Real Estate State licensure test performances expressed as a percentage of the total number of qualified candidates respectively for the Sales Associate and for the Broker exams for the fourth quarter 2015, for the entire year 2016, for the entire year 2017, and for the first quarter 2018 (Bureau of Education and Testing, 2017).