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**The Parable of the Blind Farmer:
Reactance to reform and the role of teacher satisfaction,
professional community, and willingness to innovate**

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Image 1: Plant Growth CC0

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Abstract

Most reform efforts in education are implemented without the use of evidence-based practices, which leads to reform implementation in schools that are simply not ready to reform. This thesis promotes the use of evidence-based practices, especially during pre-implementation. To this end, the author constructed an instrument to assess school conditions favorable to reform success, including teacher satisfaction, professional community, intensity of teacher collaboration, and general willingness to innovate, and compared them to levels of reactance, as well as both implicit and explicit attitudes towards a current educational initiative. A representative sample (in terms of age and gender) of 248 NMS public schoolteachers in Lower Austria showed that professional community, teacher satisfaction, and general willingness to innovate all play significant roles in educational reforms. A linear regression analysis revealed that professional community predicts teacher satisfaction, and that teacher satisfaction, in turn, predicts willingness to innovate. Furthermore, a mediation analysis found that *implicit attitudes towards a reform* played a mediating role in two relationships, between willingness to innovate and reactance to reform, as well as between reactance and explicit attitude towards reform. This indicates that how teachers implicitly feel about a reform's fundamental concepts only plays a minor role in the emergence of reactance and explicit negative attitudes. This underscores the power of reactance and the importance of carefully implemented reform efforts in an educational context.

Zusammenfassung

Die meisten Schulreformbemühungen werden ohne evidenzbasierte Methoden implementiert. Dies führt zu Reformimplementierungen an Schulen, die nicht bereit für Reformen sind. Diese Arbeit unterstützt die Verwendung evidenzbasierter Methoden, besonders in der Präimplementierungsphase. Zu diesem Zweck konzipierte der Autor ein Instrument, um festzustellen, welche der folgenden Schulbedingungen förderlich für Reformen sind:

LehrerInnenzufriedenheit, professionelle Lehrgemeinschaft, Intensität der Zusammenarbeit und allgemeine Innovationsbereitschaft. Diese wurden in Relation zu Reaktanz sowie zur impliziten und expliziten Einstellungen einer aktuellen Schulreforminitiative gegenüber gesetzt. Eine repräsentative Stichprobe (in Bezug auf Alter und Geschlecht) von 248 Lehrpersonen in öffentlichen NMS Schulen zeigte, dass professionelle Lehrgemeinschaft, Lehrerzufriedenheit und allgemeine Innovationsbereitschaft eine signifikante Rolle in Bildungsreformen spielen. Eine lineare Regression zeigte, dass professionelle Lehrgemeinschaft ein Prädiktor von Lehrerzufriedenheit ist und Lehrerzufriedenheit hingegen ist ein Prädiktor von allgemeiner Innovationsbereitschaft. Darüberhinaus ergab eine Mediationsanalyse, dass implizite Einstellungen gegenüber einer Reform in zweierlei Beziehungen als Mediator involviert sind und zwar sowohl zwischen allgemeiner Innovationsbereitschaft und Reaktanz zu einer Schulreform als auch zwischen Reaktanz zu einer Schulreform und expliziten Einstellungen einer Schulreform gegenüber. Dies deutet darauf hin, dass was LehrerInnen über ein Reforms grundlegende Konzepte davon halten, nur eine Nebenrolle in der Entstehung von Reaktanz und expliziten negativen Einstellungen der Reform gegenüber spielt. Dies betont die Bedeutung von Reaktanz und die Wichtigkeit behutsamer Reformimplementierungen in schulischen Anwendungsfeldern.

Introduction

A farmer sows seeds so they will sprout and bear fruit, but some seeds fall on hard ground and are quickly eaten by birds, while others land amongst the thistles where they are quickly choked out, some land in rocky places where they quickly take root, but are scorched by the sun. Those, however, that land on rich fertile soil can produce a hundred grains for each one sown (Matt.13, New International Version).

In the paraphrased passage above, the fate of the seed appears to depend on where the individual seeds happen to land. Either they land in undesirable places where they perish, or they land in rich fertile soil where they quickly take root and eventually bring an impressive crop. The contention of this paper, however, is that the problem is not actually where the seeds happen to land, but instead where the seeds happen to be *thrown*. Farmers, after all, know the condition of the land they work intimately. They know when to turn the soil, when to fertilize, what, when, and where to plant, and when to bring in the harvest, all based on experience and physical evidence of what has worked in the past and has been handed down from generation to generation. In short, a farmer knows the earth and can see in an instant where their precious seeds should be thrown, and they cast their seeds *knowing* very well that only a small portion of their time, effort, and other critical resources are likely to go to waste.

It is the position of this thesis that leadership and reform initiators involved in mandated and (pseudo-) voluntary educational reforms need to know the soil they intend to cultivate just as intimately, and this knowledge should come from sound evidence-based practices, because without explicit pre-implementation data collection there are simply too many seeds falling in unfavorable places, which results in an excessive waste of time, effort, financial resources, and worst of all, student potential.

With this in mind, this thesis underscores the necessity of starting the application of evidence-based practices well before implementation efforts

ever begin by pre-testing schools for the presence of what Holttappels called “fertile soil” or a “particular organizational milieu” conducive to reform (McElvany, Holttappels, & Bos, 2013, p. 48). If innovators could measure this milieu, they would be able to spend more time and effort implementing in reform-friendly schools, and schools that show more problematic tendencies could either be left out entirely or, in the best case scenario, receive appropriate professional development to cultivate more “readiness” before the implementation phase begins.

An indispensable prerequisite of an investigation into the favorable conditions for reform success is access to teachers involved in, or at least familiar with, a current, real, and uncontrived reform. Teacher responses to an online survey regarding the following initiative in Lower Austria more than adequately fulfilled this requirement.

The “Schule im Aufbruch” reform initiative

In order to understand “Schule im Aufbruch” (SiA) or “School in Departure” the first step is to understand the “Evangelische Schule Berlin Zentrum” (ESBZ). The ESBZ was founded by Margret Rasfeld and is a private alternative Christian secondary school in Berlin, Germany, that has cultivated a learning culture with a focus on potential development, talent exploration, experiencing self-efficacy, and independent, self-organized, self-paced and individualized learning; within a given framework, ESBZ students can learn what they want, when they want, where they want, and when they are ready for a test, they pick the time and day (Rasfeld & Spiegel, 2013; Rasfeld & Breidenbach, 2014; Evangelische Schule Berlin Zentrum, 2017). Further, teachers at the ESBZ play a more auxiliary role in the education of students than teachers in traditional schools; they coach students as needed, but the students are generally in charge of most aspects of the learning process (Rasfeld & Breidenbach, 2014; Evangelische Schule Berlin Zentrum, 2017). This much freedom of course requires some oversight, in their advisory role teachers maintain an overview of student progress by regularly meeting with their students and reviewing their log-books to ensure students are on track to fulfill

the requirements for the school year (Rasfeld & Spiegel, 2013; Rasfeld & Breidenbach, 2014; Evangelische Schule Berlin Zentrum, 2017). In addition to their unique approach towards the traditional school subjects ESBZ also has a few unconventional subjects as well, like “Herausforderung” or “Challenge” and “Verantwortung” or “Responsibility” where students have ample time to create and complete large-scale projects that often contain elements of community service, travel, adventure, and pushing personal limits (Rasfeld & Spiegel, 2013; Rasfeld & Breidenbach, 2014; Evangelische Schule Berlin Zentrum, 2017).

The SiA initiative was created by Margret Rasfeld to encourage other schools to “depart” from their old ways, and to adopt the ideology and methods practiced in the ESBZ, which according to Rasfeld is better suited to educating students in the 21st century than our current antiquated system that has been educating students in more or less the same fashion for a hundred years, and underpreparing children for life in the 21st century for too long (Rasfeld & Spiegel, 2013; Rasfeld & Breidenbach, 2014). The initiative itself offers teachers and schools encouragement, inspiration, and support through opportunities to network, and exchange experiences; in addition materials are offered to help teachers and school leadership with their self-implementation and adoption of the various concepts and methods behind SiA (Schule im Aufbruch: Österreich, n.d.). Much like the students of the ESBZ the implementers of the SiA initiative are supported, but in the end they are totally responsible for their own efforts regarding the program’s implementation, which means that SiA does not offer any aspect of direct oversight, so it is up to teachers and those in leadership roles to self-manage and self-evaluate the implementation of SiA concepts. SiA’s brief history in Austria is described next.

In the fall of the 2015/2016 school year SiA was introduced at the school level in Lower Austrian elementary and middle schools on a broad scale. Activities involving SiA have included seminars, conferences, viewings of promotional

videos, public speaking events, etc. The largest events to date were a large seminar led by Rasfeld herself with nearly 800 educators in attendance in November 2015, and in January 2017, Rasfeld spoke to a group of 200 educators at a symposium (Vergangene Veranstaltungen, n.d.; Schule im Aufbruch: Wege zum selbstbestimmten Lernen, 2015; Bewegte Klasse: Symposium, 2017). That school year (2015/2016) the main public teaching college in Lower Austria offered 16 other opportunities via conferences and seminars to learn more about the SiA philosophy and methodology, whereas in 2016/2017 only two seminars were offered (PH-Fortbildungskatalog, n.d.).

To be clear, this paper does not aim to, nor is it in the position to evaluate or judge the implementation of the SiA initiative in any way, shape, or form. Instead, in a wholly independent fashion, this thesis simply takes advantage of the current educational context in Lower Austria to advance the literature in terms of knowledge regarding reform-conducive school milieus, and to promote the use of evidence-based practices in education. It does this by examining dimensions found in the literature to be closely related to reform success, including general willingness to innovate, teacher satisfaction, elements of school culture, and now, thanks to SiA, psychological reactance and implicit and explicit attitudes towards a real uncontrived reform initiative.

In the end, this paper's ultimate goal is to offer educational reform initiators and would-be innovators an evidence-based instrument for pre-implementation data collection to increase their contextual awareness and hopefully improve their odds of successful implementation, because frankly, enough seeds have fallen on hard, uncultivated ground.

The following section is a review of the literature in the areas most relevant to this paper.

PART ONE: THEORETICAL BACKGROUND

A review of subject areas relevant to this thesis, including: Evidence-based practices, general willingness to innovate, teacher satisfaction, school culture in terms of professional community and teacher collaboration, and reactance

1. Evidence-based practices in education

A medical doctor working around the turn of the century spent three decades trying to convince his peers to wash their hands and follow sterile procedures before surgeries; his message for the most part, however, fell on deaf ears and the majority of doctors continued their practices as usual, and this despite over 40 years of mounting empirical evidence supporting the benefits of hygiene and sterile procedures (Slavin, 2008). Despite these meager beginnings evidence-based practices began to spread in the early 1900's amongst purveyors of medicine, agriculture, technology, etc. that slowly came to adopt the same simple and effective guiding principle that launched them into the future: "Use what works" (Slavin, 2008, p. 124; 2010).

Unfortunately, while medicine, agriculture and other fields have grown by leaps and bounds over the past decades by using evidence-based practices, the past 50 years in education have been comparatively stagnant, and indicate that the status quo still needs to be changed to better accommodate evidence-based practices and other innovations in education (Fixsen, Blase, & Van Dyke, 2012).

The importance of theory and evidence-based practices in education cannot be overstated; crucial decisions regarding educational reforms are often made without substantiating scientific evidence, which leads to decision-making based solely on cunning marketing schemes, tradition, politics, and word of mouth, which naturally increases the likelihood of making grossly misinformed decisions (Slavin, 2008). Schober, Klug, Finsterwald, Wagner, and Spiel (2012, p. 132) echoed this emphasis on the importance of evidence-based practices in educational reform, and even suggested that the current state of the Austrian school system necessitates the development of an overall school reform concept that is grounded in scientific theory and evidence-based practices.

Despite their theory and outcome driven nature, and widespread application in other fields, evidence-based programs and practices in education do not, however, necessarily always result in positive student outcomes or guaranty success, especially in situations where teachers and leadership do not completely and effectively implement the educational innovations (Fixsen et al., 2012; Schober et al., 2012). In these cases a contributing factor to the problem is that the system itself was not designed to play a supportive role in the implementation of evidence-based practices, so instead of high levels of program fidelity (which leads to better outcomes) scientifically sound innovations are often adapted to fit the current system, instead of changing the underlying structure, and therefore frequently exist in a more or less auxiliary fashion “in spite of the current system functions, roles, and structures;” this “ghost system” has a tendency to drive evidence-based innovations to the background where they inevitably have a relatively short shelf life, and as a matter of course become the latest examples of failed attempts at reform (Blase et al., 2010, p. 4; Fixsen et al., 2012). Two examples follow shortly.

In addition, implementation research has found that simply passing laws and disseminating information from the top-down is unlikely to result in implementation efforts true to the original objectives established by the designers of the innovation (Blase et al., 2010; Holtappels, 2003). This program infidelity and lack of commitment is in part due to the fact that top-down interventions create resistance and misunderstandings regarding the innovation at the school level, which makes it enticing for teachers to adapt evidence-based innovations in a way that most easily fits into their schools current situation, which is problematic for the same reasons discussed above (Holtappels, 2003).

The problem with top-down evidence-based reform is clearly illustrated by Maier (2009): In southwestern Germany, teachers' (n = 3,444) actions in response to feedback regarding student achievement from a series of

standardized tests (school level and individual teacher's classroom level) were startling. The original intention behind the standardized testing was that teachers and schools would use the feedback regarding student achievement (school and classroom level) to reflect on their own educational practices and draw conclusions from the evidence provided by the standardized test scores to optimize their instructional methods on an individual level and work cooperatively to optimize instructional methods and improve student outcomes on an institutional level. The results are staggering, Maier's survey revealed that only a small portion of teachers were even aware of the official function and duties involved with the standardized testing, and half of the teachers responded that the results of the standardized tests did not lead to personal reflection on their own classroom instruction and that the test feedback was not able to contribute to educational development in their class. Maier also found that the results were rarely used at the school level to draw conclusions from the feedback, but when it was used, it was predominantly at schools where teacher collaboration played an important role in their school culture. Acceptance of the reform effort was consistently low, and continued to decrease throughout all of their survey points. In the end, Maier found that the standardized tests failed to give an evidence-based impulse to bolster school level reform!

A similar study conducted by Kühle (2010) in western Germany questioned school leadership and teachers ($n = 7,231$) regarding their attitude towards and their use of standardized test scores. The results indicated that general willingness and interest in getting and using feedback from standardized tests is fairly widespread, but at the same time roughly a quarter of the participants strongly opposed the reform efforts. Critical requirements for the use of feedback as a tool for school reform were the acceptance of the tests and the belief that the tests can be learned from for personal professional development. Finally, Kühle emphasized the importance of the form of the feedback, considering that nearly 40% of the teachers "didn't know where to begin" with the standardized test's feedback report (Kühle, 2010, p. 294).

Both of the studies discussed above are based on effective evidence-based strategies, but in the end they were simply not adopted with full commitment and fidelity. This is what Blase (2010) calls the science to service gap, which describes a situation where what is generally known to be best practice is generally not what is adapted. Hempenstall (2006, p. 83) blames a “science-averse culture” present in teaching programs and educational policymakers for the lack of progress in education. This is exemplified by teacher training programs that often fail to expose future teachers to proven effective evidence-based practices; even the basic principles behind evidence-based practices are often ignored or at best mentioned in a “dismissive aside” (Hempenstall, 2013, p. 1).

Given the scale and the multi-dimensional nature of the challenges facing reform, and a long history of failed attempts, the question of where a given innovation might have the greatest potential for success becomes increasingly interesting. All that appears to be missing is an instrument able to detect the rich “fertile soil” necessary for reform success (McElvany et al., 2013, p. 48).

According to Fixsen et al. (2005, p. 10), since the early 2000’s some research efforts have been working in that direction, specifically research into *readiness to change* has been on the rise, and scales measuring readiness to change in individuals, organizations, and even communities have been constructed; at the time Fixsen et al. suggested that despite the fact that these measures tend to have an “intuitive appeal,” there has still not been enough evidence collected to support the idea that readiness to change is predictive of implementation success at any level (individual, organizational, or community). Fortunately, since the early 2000’s research into willingness to innovate has progressed on the European continent, and important correlates have been revealed. The following section will define general willingness to innovate, and emphasize its importance in educational reforms.

2. General willingness to innovate

A workplace innovation is described as “the intentional introduction and application within a role, group, or organization of ideas, processes, products or procedures, new to the relevant unit of adaptation, designed to significantly benefit the individual, the group, the organization or the wider society” by West and Farr (1990, p. 9). According to Emmrich (2009) this definition is still generally accepted in the field of organizational psychology, and for that reason it is also adopted here. General willingness to innovate, on the other hand, is conceptualized by Emmrich as an individual’s general disposition towards making changes in the workplace.

In McElvany et al.’s (2013, p. 35-62) book of collected works pertaining to research in education Holtappels claimed that implementation plans that assume that program adoption will result via simple dissemination and transfer are doomed from the onset; to combat this problematic truth Holtappels emphasized that a better practice for reform implementation includes teacher and school outreach to develop willingness to innovate and motivation for a particular innovation, because any *real* reform is contingent on an organizational culture that is open to and ready to innovate.

Two studies involving the development of school programs, Holtappels (2004) study in northern Germany and Burkard and Kanders (2002) study in western Germany, both found willingness to innovate and cooperation to be crucial success factors in school programs reforms. Studies involving the transition from traditional classes to all-day classes in German schools have also yielded interesting results.

Holtappels and Rollet’s (2009) longitudinal study accompanied 245 German schools during their transition from traditional half-day programs to all-day school programs. The reform took place in lower secondary schools, also known as Level 2 schools, according to the of the ISCED 1997 framework for levels of education (UNESCO Institute for Statistics, 2006), and the study

itself included schools from 14 of the 17 German provinces. The research concluded that schools with higher levels of staff willingness to innovate were generally associated with more intensive school development efforts and higher levels of school educational development goals than their counterparts with lower levels of willingness to innovate. In short, where willingness to innovate was higher innovations were implemented with more commitment, higher expectations, and higher levels of engagement.

The fact that willingness to innovate is indeed associated with better reform outcomes begs the next question: If willingness to innovate is associated with positive reform outcomes, then what teacher or school characteristics are associated with willingness to innovate? The following study sheds some light on this question.

Emmrich's (2009) study accompanied the implementation of the program "Demokratie: lernen & leben" or "Learning and Living Democracy" which aimed to reduce school violence, right-extremism, and political disenchantment by creating opportunities for schoolchildren to experience and participate in democratic processes at school. The program managed to recruit 170 schools across 13 German provinces. The Emmrich study examined teachers ($n = 220$) in this reform and transfer context, and created a five-item scale to assess willingness to innovate. The study revealed that general willingness to innovate, as a construct, was negatively correlated with occupational stress, and positively correlated with teacher satisfaction. The fact that these two variables are both associated with willingness to innovate comes as no surprise, given the strong relationship found in the literature between teacher satisfaction and occupational stress (see MetLife Inc., 2013). The next section will define teacher satisfaction, discuss further implications of teacher satisfaction, and emphasize the importance of teacher satisfaction in innovational contexts.

3. Teacher satisfaction

Job satisfaction, as described by Kalleberg (1977), refers to a unitary concept with multi-dimensional causation that captures employees' general affective orientation regarding their current work roles. Kalleberg contended that it is possible for people to weigh satisfying dimensions of their work against unsatisfying dimensions to come to a general sense of job related satisfaction, and that individuals can be characterized by this sense of overall job satisfaction. This paper adopts the construct of job satisfaction as introduced by Kalleberg (1977), in accordance with much of the source literature (see Stearns, Banerjee, Mickelson, & Moller, 2014; Stearns, Banerjee, Moller, & Mickelson, 2015; and Banerjee, Stearns, Moller, & Mickelson, 2017).

When investigating educational reform efforts, the importance of teacher job satisfaction or simply teacher satisfaction cannot be overstated, especially considering the myriad of critical outcomes linked to teacher satisfaction found in the literature. For example, the MetLife Inc. survey (2013), which interviewed 1,000 teachers and 500 principals in the United States, found teacher satisfaction to be an invaluable resource, since satisfied teachers were associated with higher levels of reform implementation, and showed greater confidence in reform processes. In contrast, they reported that teachers experiencing low satisfaction were more than twice as likely as very satisfied teachers to feel under great occupational stress. Considering the dissatisfied teachers' elevated stress level, it is not surprising that MetLife Inc. also reported that lower satisfaction was also related to perceived *decreases* in all of the following: Time to collaborate with colleagues, colleagues' ability to implement reform, quality of school leadership, school budget, and opportunities for professional development. The studies described below are able to substantiate much of what was reported by the MetLife Inc. survey.

The following studies conducted by Stearns et al. (2014, 2015) and Banerjee et al. (2017) all made use of data provided by the Early Childhood Longitudinal Program (ECLS-K), which is a nationally representative longitudinal study conducted in the United States that began in the fall of 1998

and ended data collection in the spring of 2007. The study consisted of a sample of school-aged children (N = 21,260) with seven data collection points between kindergarten¹ and the 8th grade. Information was collected twice in kindergarten and 1st grade, and once in 3rd, 5th, and 8th grade. At each data collection point students were tested, and parents, teachers, and administrators were surveyed.

Stearns et al. (2014, 2015) and Banerjee (2017) confirmed that dissatisfaction could be detrimental to a school's functioning as it is associated with increased occupational stress, lower morale, absenteeism and higher turnover; they suggested that dissatisfaction can even lead teachers to undermine educational goals, which for obvious reasons threatens the success of educational reform innovations. Continuing in this vein, Stearns et al. (2014, p. 69) stated that even "the most ambitious and well implemented reform efforts are unlikely to take hold in schools with high turnover." In fact, the general consensus is that without satisfied and committed teachers real change through reform will be difficult, because teachers are also the implementers of most reforms (Lee, Dedrick, & Smith, 1991; Ma & MacMillan, 1999).

Using the ECLS-K data, teacher satisfaction was also linked to student achievement. Banerjee (2017) used growth models to compare students in classes with either satisfied or dissatisfied teachers based on reading and math achievement growth between kindergarten and the 5th grade and found that students with satisfied teachers generally showed more growth in reading achievement, but no difference emerged between the two groups in math achievement; the relationship between teacher satisfaction and student achievement in both reading and math, however, was moderated by school culture (professional community and intensity of teacher collaboration). The

¹ As a reminder, kindergarten in America is the first class of primary school, and is therefore considered ISCED level 1, and is not to be confused with the German "Kindergarten" which is equivalent to the American preschool which is considered ISCED level 0 (see UNESCO Institute for Statistics, 2006).

implications for Banerjee are clear, the benefits of teacher satisfaction and organizational culture accumulate over time, so schools that want to succeed need to foster teacher satisfaction and encourage a thriving professional community over the long-term to create a buffer against the challenges and frustrations teachers face that negatively affect teacher satisfaction, and in turn hinder student achievement.

The assertions from the MetLife Inc. survey (2013), Stearns et al. (2014, 2015), Banerjee et al. (2017), Lee et al. (1991), and Ma and MacMillan (1999) certainly emphasize the pivotal role teacher satisfaction appears to play in the success or failure of reform processes and student achievement, but the source of teacher satisfaction itself remains unclear. The following draws on the literature to create a better understanding of the factors that play a role in teacher satisfaction.

There are many factors that play a role in teacher satisfaction, and current research suggests that a school's work environment is a stronger predictor of teacher satisfaction than the combined effect of teacher demographics and individual characteristics; teacher autonomy and school organizational culture are two dimensions of a school's work environment that are especially relevant concerning teacher satisfaction (Stearns et al., 2015). The importance of autonomy is emphasized by the claim that empowerment by means of increased classroom autonomy and increased influence in school policy decisions is associated with greater teacher satisfaction and less occupational stress (Stearns et al., 2015), whereas strong school organizational culture showed close ties to higher teacher satisfaction across all demographics, and functioning as a moderator was able to ameliorate some of the negative effects on teacher satisfaction (Stearns et al., 2014). Intensity of teacher collaboration, on the other hand, is also predictive of teacher satisfaction, and the relationship is strongest in schools with weaker professional communities (Stearns et al., 2015).

These factors, which influence teacher satisfaction to varying degrees, are discussed further in the sections below.

4. School culture

According to Schein (2004) there are three broad components that make up organizational culture: Artifacts, underlying assumptions, and espoused beliefs. First, the artifacts of an organization are right on the surface. They are the visible and identifiable structures, processes, and behaviors in an organization; this includes, but is not limited to things like how people dress, how formally or informally people act, marks of status, building design, etc. Second, the underlying assumptions of an organization are the unconscious and taken for granted beliefs and values in an organization. These can be so engrained that members of the organization may not even be explicitly aware of their existence. Third, espoused beliefs and values are those that mold interactions and expectations in the organization. The members of the organization adopt these organizational values and norms, which are generally disseminated from the top-down through all the layers of an organization.

In a more general sense, Schein (2004) stated that all organizations are defined by their culture, which includes shared assumptions, rituals, values, climate and behaviors that affect the interactions among group members, and it is this culture that separates an organization from a random assortment of people (Schein, 2004).

Schein's approach to organizational culture is not only useful in a hierarchical corporate setting; in fact his approach is equally applicable in an educational context. The organizational culture of schools, for example, can be effectively described as the result of multiple layers of cultural diffusion; school leadership establishes cultural values for their staff and student body, and the teachers' duty is to disseminate these values throughout the school, but in order for this to occur leadership must communicate the cultural values openly

and effectively to gain teachers' acceptance, because without acceptance teachers will fail to consequently promote and enact the values emphasized by school leadership, which endangers the likelihood of creating a desirable school culture (Schein, 2004; Stearns et al., 2014, 2015).

This desirable school culture mentioned above is synonymous with the "fertile soil" or "particular organizational milieu" necessary for successful school reforms mentioned in McElvany et al. (2013, p. 48). The concept itself has been discussed in the literature in terms of school culture, school community, school climate, school working environment, etc., and has been of interest in the scientific community for decades, but why? According to Stearns et al. (2015) what makes school culture most interesting to education researchers is the fact that unlike many other variables that impact teacher satisfaction, school culture is malleable, which makes it vulnerable to educational interventions and reforms.

In their groundbreaking meta-analysis of roughly a hundred papers on school effectiveness in the United States, Purkey and Smith (1982, p. 42-43) attempted to paint a picture of what it meant to be an effective school. They concluded that school culture is a determining factor in the success or failure of schools as a place of learning, and described four variables that are paramount to school culture, including: 1) Collaborative planning and collegial relationships, 2) Sense of community, 3) Clearly defined shared goals and high expectations, and 4) Order and discipline. These variables were selected on the basis of the following arguments. First, according to their analysis, change attempts are most successful when teachers and administrators work together, and collegiality, among other things, serves to break down obstacles between departments, teachers, and the administration, which encourages consensus (p. 42-43). Second, being recognized as a member of a clearly perceived community contributes to decreases in social isolation and increased academic achievement; they also suggested that the use of symbols, rules, and rituals could help build a sense of community (p. 43).

Third, a clearly defined purpose is crucial for success; the school's focus has to be on its shared goals, because reaching a consensus on school goals allows for the school's energy and resources to be put to use in a common direction (p. 43). Finally, the order and discipline created by a school communicates how the school approaches its primary task: Educating students; fair and unmistakable rules, and their consistent consequences, not only increase student behavior, but also play a role in bolstering school pride and a sense of community (p.44). Astonishingly, the critical factors proposed by Purkey and Smith (1982), which are based on studies that took place 40 to 50 years ago, appear to be nearly identical to those found in the literature today, given mild deviations and re-constellations of the dimensions, with the only exception being an "emphasis on order and discipline" (which anecdotal evidence from teachers with decades of experience suggests warrants revisiting). The following examples illustrate the continued relevance of Purkey and Smith's meta-analysis in the 21st century.

In 1991, Lee et al. described a positive school culture in terms of supportive, cooperative, and collegial relationships among staff members, shared beliefs and values concerning the school's central mission, and feelings of acceptance and mutual respect. They found that these community factors are the strongest predictors of teacher efficacy and satisfaction, and further suggested that organizational differences alone may be able to explain differences in efficacy between teachers in various schools, and not the make-up of the student body. This not only emphasizes the important role of school culture, but also shares a great deal of common ground with Purkey and Smith's original report.

In a similar vein, Shen, Leslie, Spybrook, and Ma (2012) indicated that working conditions, staff collegiality, supportive leadership, and to a lesser extent teacher empowerment and positive student behavior were all important aspects of school culture with serious implications regarding teacher satisfaction. In addition, using a multi-level model Shen et al. (2012) also

found that there is sufficient variation between schools to suggest that school-level factors, like those that make-up school culture, can make a significant difference in teacher satisfaction, and for this reason Shen et al. suggested that hiring practices for school leadership positions should not be based on the amount of education or years experience, but instead the deciding factor for selecting a prospective principal from a pool of applicants should be the presences of leadership skills at a level capable of instilling and maintaining school culture. Beyond their belief in the power of school culture and the distinct overlap with Purkey and Smith (1982) in their operationalization of school culture, Shen et al.'s suggestion for school culture improvements was also reminiscent of Purkey and Smith (1982), as the following illustrates.

In order to improve schools struggling with achievement, Purkey and Smith (1982, p. 46) cautioned that “decrees from the top” or top-down reform demands are effective in altering only the structure and form of the school, but the resulting changes are mostly superficial, and that these mandated changes are rarely effective in cultivating a strong school culture. Instead, Purkey and Smith supported change from within, starting with a strong leader or a small group of leaders with enough vision and energy to effect change. They also indicated that the inclusion of all affected parties in decision-making processes throughout the change was of particular importance, as it allows teachers to maintain their autonomy, which increases an innovation's likelihood of success. Purkey and Smith stated that as time passes the resulting bargaining, collaborating, and participation in important school decisions, etc. create a milieu of teacher and administration consensus, which replaces the overt control of teachers by administrators as the team's organizational and workplace beliefs unite. The overt-control mentioned here is perceived as a reduction of teacher autonomy or freedom, which under the right circumstances leads to reactance; this relationship will be further discussed in section 5, which is dedicated specifically to reactance.

More recently, a growing body of literature has adopted a definition of school culture that is very much in-line with the traditional definition established by Purkey and Smith (1982). Moller et al. (2011, 2013), Stearns et al. (2014, 2015), and Banerjee et al. (2017) all operationalized school culture using the same constellation of variables and the same definition. According to their research, which used a nationally representative sample (ECLS-K) in the United States, school culture or collective pedagogical teacher culture as they have coined it, consists of two main factors: Professional community and teacher collaboration. According to them, professional community as a construct is based on the following five variables: Level of school spirit among teachers, a leadership established school mission (well-communicated and shared), teachers agree with the mission communicated by the leadership, teachers feel accepted and respected as colleagues, and teachers are constantly engaged in learning. On the other hand, they claimed intensity of teacher collaboration is based on the perception of the following three variables: Intensity of collaboration with colleagues on lesson plans, curriculum development, and the frequency of meetings to discuss student needs. Using the concept of collective pedagogical teacher culture (professional community + intensity of teacher collaboration) a number of significant relationships were reported. A summary of the results for the two main factors in Moller et al. (2011, 2013), Stearns et al. (2014, 2015), and Banerjee et al.'s (2017) collective pedagogical teacher culture comes next.

Professional community and teacher collaboration

First, Moller et al. (2011) found that disengaged students' (based on attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization) achievement growth in mathematics was moderated by their school's level of professional community, regardless of racial background (Black or White). This showed that the presence of a professional community at school creates a setting where even disengaged students have a chance at academic growth. This, however, was not the case for teacher collaboration. Only in isolated instances did teacher collaboration bring significant differences. For example, Black engaged students saw

benefits from schools with increased levels of teacher collaboration, but student achievement growth for White and Hispanic students were, however non-significant. Moller et al. (2011) also reported that engaged students with low or middle socioeconomic status (SES) had higher mathematics achievement trajectories when higher levels of teacher collaboration was present at school. Students with high socioeconomic status showed strong mathematics achievement growth regardless if they attended a school with high levels of teacher collaboration or not. This indicates that there are indeed circumstances where degree of teacher collaboration plays an influential role in the lives of young people, albeit not as wide a spectrum as the impact felt by professional community.

Moller et al.'s (2013) contributed to the growing body of evidence regarding the role of professional community and teacher collaboration in racial and SES achievement gaps. They found that strong professional communities were able to markedly increase the achievement of Black students with low SES when contrasted with their low SES White and Hispanic peers. This clearly emphasizes the important role professional community plays in efforts to reduce racial and SES gaps in education. Moller et al. (2013) claimed that the benefit may not actually be due to the presence of the professional community, but rather it protects students from the negative effects of a non-professional community. The teacher collaboration aspect of their investigation found no "robustly significant" relationships between any of the categories of low SES, which suggests that teacher collaboration has no influence in closing educational gaps due to low SES, regardless of student race (p. 184). They did, however, report that middle SES White students attending schools with higher levels of teacher collaboration showed a significant bump in achievement in comparison to their peers in schools with lower levels of teacher collaboration. Despite the fact that middle SES White students were helped by increased teacher collaboration, the gain did not contribute to a significant expansion of the racial gap in education between Black and White students with middle SES, which the authors explain is likely

due to the fact that all students benefited from the teacher collaboration, just not enough to reach significance. Finally, Moller et al. (2013) indicated the absence of racial disparities in the growth of mathematics achievement in high SES students, but in schools with low levels of teacher collaboration White high SES students outperformed their Black and Hispanic counterparts. Again, we see that professional community seems to have a broader impact, whereas teacher collaboration tends to be instrumental in fewer, and more particular situations.

Stearns et al.'s (2014) continued in this line of research with a focus on teacher job satisfaction and race, in addition to professional community and teacher collaboration. First, Stearns et al. reported that in general, White teachers are less satisfied than Black teachers, and that professional community is more closely tied to White teachers' satisfaction than their Black counterparts, but interestingly, all teachers are more satisfied in schools with a higher degree of professional community. This satisfaction gap was greatest in school with the lowest professional community. They further described professional communities role in what they termed ethno-racially mismatched classrooms, which simply refers to a teaching context where a teacher of one race has a class of predominantly a different race. Interestingly, they reported that non-mismatched White teachers are more satisfied than non-mismatched Black teachers, whereas mismatched White teachers were more dissatisfied than non-mismatched Black teachers. In a twist, they also reported that mismatched Black teachers tend to be more satisfied than non-mismatched Black teachers. The researchers found that heightened levels of professional community were able to mitigate the effect of ethno-racial mismatch on White teachers. Teacher collaboration, as a footnote indicated, played no significant role in the investigation. Again, the research suggests that professional community plays a broader role in education than teacher collaboration.

This research was followed by Stearns et al.'s (2015) study on the role of professional community, teacher collaboration, and aspects of teacher

autonomy on teacher satisfaction. Stearns et al. reported that professional community, teacher collaboration and perceived aspects of teacher autonomy are all individually associated with teacher satisfaction, but when combined into a single model, only professional community remains significant. This was not surprising, especially considering that the small slopes associated with teacher collaboration and the two aspects of teacher autonomy may have only reached significance in part due to the large size of the sample ($n=1890$). Despite this, using hierarchical linear regression modeling, Stearns et al. found that a significant interaction between professional community and teacher collaboration could be successfully modeled to predict teacher satisfaction, albeit extremely weak and not in the theoretically proposed direction with a *slope coefficient* of $-.06$, $p < .05$, and $SE = .03$ in a sample of $n = 1,890$. This does not, as they claim, support the notion that increases in teacher collaboration and professional community are interactively involved in increases in teacher satisfaction. As a contrast, all their linear models that include professional community as a predictor reported a *slope coefficient* for professional community = $.35$, $p < .001$, with a $SE = .03$; in all of the models where professional community was present teacher collaboration was non-significant, and in the only instance where it reaches significance its value was underwhelming with a *slope coefficient* = $.06$, $p < .05$, and $SE = .03$. Again, it appears that professional community plays a far more commanding role than teacher collaboration as a predictor of teacher satisfaction, and a need for further investigation is becoming more and more necessary to establish additional clarity in the literature.

Finally, the most recent literature in this line of study comes from Banerjee et al.'s (2017) growth model research into the role of professional community and teacher collaboration in teacher satisfaction and student achievement. Using extreme group comparisons, Banerjee et al. suggested that professional community functions as a buffer in the relationship between teacher satisfaction and student achievement in both reading and mathematics; their findings indicated that students assigned to dissatisfied

teachers attending schools with high levels professional community tend to be higher achieving than their peers assigned to dissatisfied teachers attending schools with low levels of professional community. There were, however, no significant differences found between students with satisfied teachers in either school type. In addition, Banerjee et al. reported that teacher collaboration levels had no effect on the relationship between teacher satisfaction and student achievement in mathematics, but ironically they found that students assigned to dissatisfied teachers in schools with weak levels of collaboration actually score higher in reading achievement than their counterparts assigned to dissatisfied teachers in highly collaborative schools! This indicates that working together and collaborating is not always a positive experience, especially for dissatisfied teachers, so sometimes not collaborating is actually a protective factor for student achievement. Banerjee et al.'s results confirm that professional community generally has stronger, more impactful, and more predictable associations than teacher collaboration.

Going forward, due to the close relationship with Purkey and Smith's (1982) factors for effective schools, the prevalence of the individual elements in the literature, the brevity of their scales, and its modestly successful application on a nationally representative dataset the definition of school culture (professional community + intensity of teacher collaboration) will be adopted per Moller et al. (2011, 2013), Stearns et al., (2014, 2015), and Banerjee et al. (2017) for the purposes of further investigation in this thesis with the intention of adding clarity and insight into the relationship between teacher satisfaction, professional community, and teacher collaboration.

5. Reactance to reform

Stearns et al. (2015) raised the importance of *teacher autonomy* in the context of teacher satisfaction and school culture, but the term itself has yet to be defined. According to the Glossary of Educational Reform, teacher autonomy is a concept that "refers to the professional independence of teachers in schools, especially the degree to which they can make autonomous decisions

about what they teach to students and how they teach it” (Teacher Autonomy, 2014). This paper, however, does not directly examine teacher autonomy in a general way, but instead examines a related psychological phenomenon known as *psychological reactance*, which is brought forth by threats to personal freedoms and choice. This paper makes the logical assumption that reforms that are deemed by teachers to restrict personal freedoms and choice in the workplace (which bring about reactance under certain circumstances) also constitute a reduction in teacher autonomy.

Brehm (1966) coined the term psychological reactance to describe a motivational arousal state directed toward regaining a particular threatened or eliminated freedom that manifests itself in an increased desire or actual attempt to engage in the threatened behavior; whatever freedom is threatened, the resulting reactance invariably leads to an increase in perceived attractiveness of that option, and the opposite is true for forced options, which tend to lose their attractiveness (see also: Miron & Brehm, 2006; Nesterkin, 2013; and Steindl, Jonas, Sittenthaler, Traut-Mattausch, & Greenberg, 2015). In addition, Brehm determined two pre-requisites for experiencing psychological reactance: First, the knowledge that the freedom actually exists, and second, the ability to exercise that freedom. Psychological reactance as a construct and its pre-requisites are further clarified below.

The following original consumer behavior study was conducted by Weiner and Brehm (as cited in Brehm, 1966) in order to explore the phenomenon of reactance when it was still in its infancy. The participants were all instructed to buy a loaf of bread made by a particular brand. The study consisted of three conditions: first group (freedom threat group) was told to “buy a particular brand of bread.” This was the *freedom threat condition*, because the instructions in this condition limited participants’ freedom to just one brand, despite the presence of both pre-requisites for reactance (awareness of a number of alternatives and the ability to exercise their freedom to choose). According to reactance theory, this should result in increased attractiveness of

the alternative brands of bread and a decrease in perceived attractiveness of the brand assigned for purchase. The second group (non-threatened group) was told to “please try a particular brand of bread.” This is the *non-threatened condition*, because participants’ freedom has not been limited to a particular brand, instead they have just been asked politely to try a particular brand and no alternatives have been purposely suppressed. Both pre-requisites for reactance have also been met for this group. The third group (no freedom group) was told, “you are going to buy a particular brand of bread.” This is the *no freedom condition* because participants were instructed in a manner that stripped them of their ability to exercise their freedom to choose, which violates the second pre-requisite for reactance.

The results of the study were in-line with Brehm’s assumptions; the following percentages indicate what percent of a particular experimental group followed the instructions and actually bought the instructed brand of bread: The *freedom threat group* (24%), the *non-threatened group* (70%), and the *no freedom group* (51%). As Brehm’s reactance theory suggests, the group with the freedom threat (“buy a particular brand”) showed the most reactance, the non-threatened group (“please try a particular brand”) was the most compliant, and the no freedom group (“you are going to buy a particular brand”) showed more compliance than the threatened group, but less than the non-threatened group, because the instructions “you are going to...” removed freedom from their selection, which violated the second pre-requisite for reactance, and as expected resulted in less reactance. Nevertheless, the most forceful condition resulted in compliance in only about half of the participants.

The link between reactance and behavior, shown here, is not only central to this thesis, but has also proven to be of great interest well outside the field of its founding, including public health, marketing, politics, and education (Steindl, Jonas, Sittenthaler, Traut-Mattausch, & Greenberg, 2015). The gravity of reactance’s role in human behavior illustrates the necessity of tact

and sensitivity when introducing changes, and emphasizes the pitfalls associated with heavy-handed top-down mandates. Traut-Mattausch, Jonas, Förg, Frey, and Heinemann's (2008) reported findings that cement this very idea.

In Munich, Germany, Traut-Mattausch et al. (2008) conducted a study that showed how messages about policy changes and reforms can be framed by politicians to avoid reactance and negative attitudes, so that *necessary* reforms to solve current problems can be implemented with minimal public backlash. They suggested that a reformer's message can go in one of two directions, either they can focus on increased communication of limitations due to the reform (limitation justification) or they can focus on the expected improvements associated with the reform (improvement justification). Examples of both of these forms of justification are found below.

In their study participants received one of two modified versions of the same newspaper article about a particular piece of German unemployment legislation that aimed at reducing the cost of unemployment benefits in Germany. One version was modified with a focus on limitations, and the second version was modified with a focus on improvement justification; the improvement justification version used phrases like, "more fairness for all people," "better mentoring for the unemployed," and "protection for people in need," whereas the limitation justification version use phrases like "more sanctions against unemployed people," and "benefit cuts for specific groups of people" (Traut-Mattausch et al., 2008, p. 219).

Based on reactance theory, the researchers hypothesized that reforms communicated with a limitation justification would result in more reactance than reforms communicated with a focus on improvements. The results confirmed their assumptions that reform efforts that focus on improvement justification, and not limitation justification, lead to better attitudes towards the reform, and the difference between the two was mediated by reactance. An

essential part of any reform implementation is the willingness of people to take on necessary challenges, and if the message sent from the reform initiator is perceived as a freedom threat then reactance emerges with negative attitudes in tow (Traut-Mattausch et al., 2008). These negative attitudes endanger the success of reforms and organizational changes, because overly forceful messages attempting to persuade the target group lead to undesirable behavioral intentions (Dillard and Shen, 2005). The following German study shows just how an intervention's elicited reactance can influence participant behavioral intentions, and shows the severity of the implications linked to program elicited reactance.

Ungar, Sieverding, Schweizer, and Stadnitski (2015) conducted a study on intervention elicited reactance by introducing college students to a one-week health promotion program that intended to increase fruit and vegetable consumption in college students. The participants were randomly placed into one of three conditions that varied regarding the intensity of the health message. The first group was asked to eat one more portions of fruit or vegetables a day than usual. The second was asked to eat five portions of fruit and vegetables a day, and the control group was instructed to eat normally. Both of the experimental groups had higher rates of reactance than the control group, whereby the five portions a day group showed higher levels of reactance after week one than the one more portion a day group. The results also showed a negative correlation between reactance, and the attitudes and intentions that followed. Even four months after the intervention there was still a significant relationship between the experienced reactance and actual lower consumption of fruits and vegetables. This study clearly verified the all-important links between reactance, attitudes, intentions, and in the end behavior.

In an educational reform context, the studies above clearly indicate the necessity of tact, sensitivity, and a focus on situation improvement during pre-implementation information dissemination and program introduction, if

reactance is to be purposely and effectively held to a minimum. An additional unintended and somewhat counterintuitive consequence of overly forceful reform messages is discussed next.

The boomerang effect (Brehm, 1989; Herkner, 2001) describes the following phenomenon in reactance theory: It turns out that the people that are originally in the most agreement with the change initiator's plans are also the most susceptible to the negative consequences of psychological reactance, including large attitudinal shifts, which are associated with decreased compliance that can occur in response to forcefully introduced reforms. A possible explanation for this occurrence is that those that already hold negative or neutral attitudes towards a given reform are less affected by reactance in terms of attitudinal shifts, which consequently shape later intentions and behaviors, because their attitudes may experience a basement effect, in that their attitudes can only be swayed so far into the negative, whereas a person in agreement with the change can be affected attitudinally to a larger degree, because their initial attitude is so positive, which leaves them more potential to move down the attitudinal spectrum.

In an educational context this would mean that the teachers that were originally in complete agreement with the need for reform and even the reform program itself are the most susceptible to the negative outcomes associated with psychological reactance; in this case the initiator of the reform is effectively upsetting its own base more than it is persuading new participants to join its cause, which clearly could have catastrophic consequences for the reform effort (Brehm, 1989; Herkner, 2001).

Given the overwhelming indications of the important role reactance plays in reform processes, it is not surprising that in McElvany et al.'s (2013, p. 75-76) book of collected works pertaining to research in education Terhart observed that educational researchers and policy makers often naively expect that schools and teachers are waiting impatiently for the next big breakthrough to

be developed to transform their classrooms when the reality is that their efforts are often met with ridicule for the project and disdain for the “clueless experts” that “don’t understand anything” and “never accomplish anything.”

Despite the breadth and depth of the literature found in the five areas discussed at length above, there are still several areas that lack clarity and a number of possible relationships that require further examination. The following section lays out the current research’s attempt to expand the scientific body of evidence in educational reform in an effort to reduce some of the gaps found in the literature, and provides thorough justification for the proposed research questions and hypotheses.

6. Research Questions and Hypotheses

The research described above certainly offers a great deal of insight into the roles teacher satisfaction, professional community, teacher collaboration, willingness to innovate, and reactance play in an educational reform context, but there are still a number of areas that require further investigation and many new questions have come to light in the process. The following research questions were strictly developed out of the literature and formed in an attempt to fill gaps in the literature and to improve upon the limitations of previous studies; the research questions and the justification for their inquiry are described below:

1. Are professional community and teacher collaboration related to teacher satisfaction?

Moller et al. (2011, 2013), Stearns et al., 2014, 2015), and Banerjee et al.'s (2017) work used data from a massive nationally representative longitudinal study in the United States to examine the role and impact professional community and teacher collaboration play in educational contexts. Although their work offered a great deal of support for the critical nature of professional community, teacher collaboration, on the other hand, continually played a far more erratic and generally weaker role, regardless of the educational context being investigated. The first research question intends on examining the relationship between these two school culture factors more closely, especially regarding possible associations with teacher satisfaction. Teacher satisfaction was selected due to the relationships reported in previous studies to professional community and teacher collaboration, and also due to the overwhelming support in the literature for the importance of teacher satisfaction (see Lee et al., 1991; Ma and MacMillan, 1999; MetLife Inc., 2013; Stearns et al., 2014, 2015; & Banerjee et al., 2017) An examination of this relationship using a new sample may help add clarity to this often murky area of research. The following hypothesis was derived directly out of the current literature:

H₁: Professional community and intensity of teacher collaboration are related to teacher satisfaction.

2. Is teacher satisfaction associated with a general willingness to innovate?

- If so, is this relationship mediated/moderated by professional community or intensity of teacher collaboration?

The link between general willingness to innovate and the success of educational reform efforts appears to be uncontested, despite a number of investigations (e.g. Burkard & Kanders, 2002; Holtappels, 2004; Holtappels & Rollet, 2009; Emmrich, 2009; & McElvany et al., 2013). As opposed to the link between teacher satisfaction and willingness to innovate, which has received less attention in the literature, but nonetheless has been at least implied by two publications, including Emmrich (2009) and MetLife Inc. (2013). Whereas, to date the influence exercised by professional community and teacher collaboration as possible moderators/mediators in the relationship between teacher satisfaction and general willingness to innovate has gone uninvestigated. Given the assumed close relationship between teacher satisfaction and school culture, and the moderating role of professional community and teacher collaboration in other relationships, it seems natural to include professional community and teacher collaboration as possible moderators/mediators in the examination of the relationship between teacher satisfaction and general willingness to innovate (Stearns et al., 2014, 2015; & Banerjee et al., 2017). The following hypotheses were derived directly out of the current literature:

H₂: Teacher satisfaction is associated with general willingness to innovate.

H_{2a}: Given H₂, professional community will play a moderating role in the relationship between teacher satisfaction and general willingness to innovate.

H_{2b}: Given H₂, professional community will play a mediating role in the relationship between teacher satisfaction and general willingness to innovate.

H_{2c}: Given H₂, intensity of teacher collaboration will play a moderating in the relationship between teacher satisfaction and general willingness to innovate.

H_{2d}: Given H₂, intensity of teacher collaboration will play a mediating in the relationship between teacher satisfaction and general willingness to innovate.

3. Is general willingness to innovate negatively associated with reactance to a real, uncontrived, specific reform?
 - If so, is this relationship mediated/moderated by implicit agreement with the educational concepts behind the reform?

The literature indicates that general willingness to innovate is certainly related to the success of educational reform efforts, but the role psychological reactance to a real, uncontrived educational reform plays in terms of general willingness to innovate remains uninvestigated (see Burkard and Kandera, 2002; Holtappels, 2004; Holtappels and Rollet, 2009; McElvany et al., 2013, p. 35-62). Furthermore, in an effort to bring more clarity into this situation due to gaps in the literature implicit attitudes towards educational concepts from the SiA reform are included as a possible moderator/mediator, because it is the author's opinion that implicit attitudes towards the basic educational principles of a reform may influence levels of teacher reactance, in that teachers with lower implicit attitudes towards SiA may be more inclined to show reactance than those with higher implicit attitudes towards SiA. The implicit attitudes to SiA, which are purposely collected with an emphasis on avoiding a connection with SiA by using veiled items, add important detail to the relationship between general willingness to innovate and reactance to reform. The practical importance for implementers regarding this question is clear: If reactance is found and it is closely linked to negative implicit attitudes towards the program's fundamental concepts, then this may signal a problem with fundamental aspects of the program and not the implementation itself. On the other hand, if reactance is present and implicit attitudes towards the reform are not overly involved, meaning that the participants that tend to agree with the fundamental concepts of the reform but nonetheless demonstrate reactance, signals that the problem lies with the implementation itself or even with the implementers themselves, and not simply the reform. The following hypotheses were derived directly out of the current literature:

H₃: General willingness to innovate is associated with reactance to a real, uncontrived, and specific reform.

H_{3a}: Given H₃, implicit agreement with the educational concepts behind a reform plays a moderating role in the relationship between general willingness to innovate and reactance to a real, uncontrived and specific reform.

H_{3b}: Given H₃, implicit agreement with the educational concepts behind a reform plays a mediating role in the relationship between general willingness to innovate and reactance to a real, uncontrived and specific reform.

4. Is reactance to a real, uncontrived, and specific reform associated with explicit negative attitudes towards the reform?

- If so, is this relationship mediated/moderated by agreement with the “educational concepts” behind the reform?

Research in reactance consistently indicates the severity of the negative consequences involved with psychological reactance in persuasion attempts and attempts at policy reform; psychological reactance generally leads to undesirable changes in personal intentions and behaviors among those affected by the reform (Brehm, 1966; Dillard & Shen, 2005; Miron & Brehm, 2006; Traut-Mattausch et al., 2008; Nesterkin, 2013; Steindl et al., 2015; Ungar et al., 2015). Even though the relationship between reactance and negative attitudes explicitly directed towards change efforts has been thoroughly documented in the literature, the relationship between reactance and explicit attitudes towards a real, uncontrived educational reform remains under investigated. Missing completely in the literature is the role of veiled attitudes towards a real, uncontrived educational reform, which this thesis includes in an effort to determine what role implicit attitudes towards a reform’s basic principles play in the relationship between reactance and explicit attitudes towards the reform (SiA). The practical implication, as above, is that if the influence of the implicit attitudes (based on veiled items) is what actually drives the reactance and explicit negative attitudes towards the reform then there is likely a problem with the reform itself, but on the other hand, if the implicit attitudes play a lesser role, then the problem lies within the

implementation itself or with the implementers themselves. The following hypotheses were derived directly out of the current literature:

H₄: Reactance to a real, uncontrived, and specific reform is associated with explicit negative attitudes towards the reform.

H_{4a}: Given H₄, implicit agreement with the educational concepts behind the reform play a moderating role in the relationship between reactance to a real, uncontrived, and specific reform and explicit negative attitudes towards the reform.

H_{4b}: Given H₄, implicit agreement with the educational concepts behind the reform plays a mediating role in the relationship between reactance to a real, uncontrived, and specific reform and explicit negative attitudes towards the reform.

The empirical investigation into these research questions and hypotheses follows.

PART TWO: EMPIRICAL INVESTIGATION

An examination of the predictors of teacher satisfaction, general willingness to innovate, psychological reactance and attitude towards reform

Method

1. Recruitment

247 public NMS schools in Lower Austria² received a recruitment email (see Appendix A) on February 20, 2017. Participation was voluntary, and in return for participation schools were offered a school profile pertaining to school culture, willingness to innovate, and reform. If a director had interest in participating, they only had to reply to the initial message with “yes” and the number of teachers at their school. The 15 directors that responded to the initial recruitment email with a desire to participate then received a reply which included a brief message, school code, and a survey link to forward on to their teachers (see Appendix B). Ten days later the 225 schools that had not yet responded received a reminder message per email (see Appendix C). This message, unlike the initial message, did not require an active opt-in to the study, but instead requested that the message, which already included a code and survey link, be promptly passed on to their teachers via the school’s mailing list. The second wave of recruitment messages was all given the same school code. This action, for all intents and purposes, assigned all further respondents to the same generic group. The intention was to further increase anonymity in an effort to increase participation. In the end 64.9% of the respondents came from the second wave of recruitment.

2. Participants

The recruitment described above yielded a sample of $n = 260$ completed surveys. The data cleansing prior to the statistical analysis eliminated 12 cases, which left the sample size at 248 teachers. Reasons for deletion included: Incomplete surveys, obvious patterns, signs of “clicking through,” etc. This sample represents 4.5% of the lower middle school teacher population in Lower Austria ($N = 5489$, not including teachers on leave) (Statistik Austria, 2016).

² The schools were located using the following search engine http://www.schulen-online.at/sol/oef_suche_schulen.jsf. This returns 249 results for a search of public NMS schools in Lower Austria at the date of publication.

189 of the respondents were women (76.2%) and 57 were men (23%). The remaining two participants did not provide a response (0.8%). The gender gap present in the sample was expected, considering a government report released in 2015 showed that lower middle schools in Lower Austria employ 76.5% female teachers and 23.5% male teachers on average (BMBF, 2015). The mean age of the current sample was 47.9 years old, whereby on average the men were older than the women (see Table 1). However, an independent samples t-test revealed that there was not a significant difference between the average age of females ($M = 47.5$, $SD = 11.1$) and the average age of males ($M = 49.5$, $SD = 10.8$) in the current sample; $t(243) = -1.20$, $p = .956$.

TABLE 1: Gender and Age in the sample and population

	<i>Gender</i> <i>sample %</i>	<i>NMS%</i>	<i>Age</i> <i>S ≥ 50</i>	<i>AT ≥ 50</i>
Female	76.8	76.5	54	-
Male	23.2	23.5	60.1	-
Total	100	100	55	53.3

Note: NMS = Lower Middle Schools in Lower Austria; S ≥ 50 = the percent of respondents in the sample over 50 years of age; AT ≥ 50 = percent of Austrian lower middle school teachers over 50 years of age.

An additional ministry of education report found that 53% of teachers in Austrian lower middle schools are over the age of 50 (Bruneforth et al., 2016). In comparison 55.5% of the participants in the current study are over 50 years of age. These values (bold in Table 1) suggest that the current sample does not significantly differ, at least in terms of gender and age, from the population of teachers in NMS schools in Lower Austria. Despite these encouraging values, the double dose of self-selection (1. Principals decide if their school will participate or not, and 2. Teachers decide to participate or not) involved in the current study prohibits a general claim of representativeness, due to the increased threat of self-selection bias in the current sample. The problems

associated with this are discussed further in the discussion section of this paper.

Nonetheless, two separate one sample non-parametric tests of independence (chi-square tests) show that the sample values for age and gender do not significantly differ from those of the target population (age ≥ 50 : $\chi^2(1) = 0.62$, $p = .431$, Monte Carlo $p = .45$, CI: [.42, .48]); gender: $\chi^2(1) = 0.02$, $p = .90$, Monte Carlo $p = .95$, CI: [.93, .96]), which indeed speaks to the representativeness of the current sample in terms of age and gender, but the possible self-selection bias described above makes an outright claim of representativeness in the current sample imprudent. The demographic information is available in its entirety in Appendix D.

3. Instrument

The survey consisted of six scales, which amount to 42 items. The scales, which appeared in the following order, included measures of teacher satisfaction (*TSat*), collective pedagogical teaching community (*CPTC*) which consisted of professional community (*ProCom*) and intensity of teacher collaboration (*TCollab*), general willingness to innovate (*Innov8*), implicit attitudes via veiled educational concepts (*EdCon*), reactance to SiA (*React*), and finally explicit attitude towards SiA (*At2SiA*).

Additionally demographic information was collected. In addition to age and gender, the survey collected data regarding teacher education, teaching certification, teaching experience, and current teaching commitment, but was not used for this study. However, the survey in its entirety and the corresponding descriptive statistics are available in Appendix D.

The participants took an average of 6.99 minutes to complete the survey with a $SD = 2.23$.

Since three scales were translated from English to German, three native German-speaking teachers examined the instrument's language use for clarity and comprehensibility. The present study began upon receiving positive feedback from all three reviewers.

Teacher satisfaction

Scale 1: This originally English teacher satisfaction scale from Stearns et al. (2014) utilized three items (5-point Likert response scale) pertaining to two distinct sources of teaching satisfaction: sense of efficacy and satisfaction. The first item, *I really enjoy my present teaching job*, and the third item, *If I could start over, I would choose to teaching again as my career*, both target the satisfaction aspect, whereas the second item, *I am certain I am making a difference in the lives of the children I teach*, targets the efficacy aspect of teacher satisfaction.

The brevity of the scale and the fact that most job-satisfaction scales do not target teachers specifically make this particular instrument both desirable and appropriate for the current study. Stearn et al. (2014) reported an internal consistency for the scale with a Cronbach's $\alpha = .73$.

Professional community and teacher collaboration

Scale 2: The collective pedagogical teaching culture (CPTC) scale found in Moller et al. (2011, 2013), Stearns et al. (2014, 2015), and Banerjee (2017) consists of eight items (5-point Likert response scale), and was originally created in English. The CPTC scale consists of two main components: Professional community and intensity of teacher collaboration. The former offers insight into teachers' perception of their school's level of professional community based on items pertaining to an "agreed upon [school] mission, school pride, orientation towards learning, and a sense of belonging." whereas the latter offers insight into the teacher's perception of collaboration intensity at school. Collaborative teaching communities "reflect[] an environment where teachers build their lessons cooperatively, eliminating

redundancy, and increase compatibility across parts of the curriculum” while keeping student needs in mind (Moller, 2013, p. 176-177).

The scale’s combination of professional community and collaboration, and its limited number of items make it an appropriate and reasonable choice for examining the research questions in the current study. Moller et al. (2011, p. 12) reported an internal consistency for the professional community scale with a Cronbach’s $\alpha = .78$ in their survey of 5th grade teachers; they also reported “alphas above .80 in Kindergarten, First grade, and Third grade.” Stearns et al. (2015) reported an average inter item correlation of $r = .71$ for the three item intensity of teacher collaboration scale.

Example items from collective pedagogical teaching culture:

- *I feel accepted and respected as a colleague.*
(Professional community: Typical Likert response scale)
- *How frequently do teachers meet to collaborate on lesson planning?*
(Teacher collaboration: Frequency response: Never, once a month or less, 2 to 3 times a month, 1-2 a week, more than 3 times a week)

Willingness to Innovate

Scale 3: The willingness to innovate scale consists of five items with a 4-point Likert response scale (Emmrich, 2009). This scale makes it possible to make statements pertaining to teachers’ disposition towards change and innovation in the school context, while also allowing for commentary on teachers’ personal capacity to insight change. Further, most instruments available do not have teachers specifically in mind when considering willingness to innovate, and were not originally conducted in German, all of which make this scale especially desirable. Emmrich (2009) reported a satisfactory internal consistency with a Cronbach’s $\alpha = .74$.

Example items from willingness to innovate scale:

- *I want to integrate new content into my work, even if it means having to do more work.*

- *I'm prepared to continually modify my work as a teacher.*

Implicit attitudes towards SiA via veiled items

Scale 4: This newly constructed German scale consists of 13 items with a 6-point Likert response scale, and operationalizes the concepts that form the foundational principles for the school initiative SiA. The concepts are “veiled” in that they are not explicitly mentioned in the context of SiA, which enables this scale to locate discrepancies between explicit attitudes towards SiA, reactance to SiA, and implicit attitudes towards the founding principles of the initiative.

Further, in an effort to curb social desirability bias buzzwords have been intentionally avoided, instead where possible these concepts were asked in an indirect fashion.

Example items from veiled educational concepts:

- *Schools should foster students' motivation to learn, and their ability to work independently. (SiA concept: Life-long learning)*
- *Schools should increase students' confidence in their own abilities. (SiA concept: Importance of experiencing self-efficacy)*

Reactance to “Schule im Aufbruch”

Scale 5: The original intervention-elicited reactance scale from Ungar et al. (2015) consisted of six items with a 7-point Likert response scale. However, item 5 was discarded as it was deemed too unspecific and too similar to item 6. This deletion increased the scale's economy and its specificity.

The original German items were geared towards measuring the reactance elicited by a program designed to increase consumption of fruits and vegetable, which made adapting the items to the current study necessary; an example of said adaptation can be found below.

This measurement of elicited reactance allows statements about perceived restrictions and loss of freedom as a result of reform initiatives. The short nature of this instrument, the original German items, and the importance of operationalizing state reactance to the current study all make this scale indispensable. Ungar et al. (2015) reported an internal consistency of Cronbach's $\alpha = .92$.

Example item from the intervention-elicited reactance scale:

- Original item: *Due to my participation in this study I felt put under pressure.*
- Adapted item: *Through my experience with "Schule im Aufbruch" I felt and/or feel put under a great deal of pressure.*

Explicit attitude towards "Schule im Aufbruch"

Scale 6: The attitude scale from Shen and Dillard (2005) consists of seven starkly polarizing word-pairs, one of which inherently positive and the other inherently negative. The attitude scale uses a 7-point semantic differential scale. The current study, however, opted for a forced choice 6-point semantic differential scale.

This attitude scale allows statements regarding teachers' mindset towards SiA, which represents an important element in the context of school reform. The translated English items retained their strong polarizing nature that should provide reliable data pertaining to teacher attitudes towards the school initiative SiA. For these reasons, this particular attitude scale is an appropriate choice for the current study. Shen and Dillard reported a satisfactory internal consistency for two samples with Cronbach's $\alpha = .84$ and $.89$, respectively.

Example items from the attitudes towards "Schule im Aufbruch" scale:

- *bad* ○○○○○○ *good*
- *unnecessary* ○○○○○○ *necessary*

- *detrimental* ○○○○○○ *beneficial*

The survey was created using SoSci Survey (Leiner, 2014), and made available to the participants at www.soscisurvey.de. The data collection phase ran for four weeks, ending on March 19, 2017.

4. Statistical Analysis

Influential cases and missing data

Where appropriate Cook's distances, Mahalanobis' Distances, Leverage values, and standardized DFBETA values were all used to search for overly influential cases as suggested by Field (2013). As a result no data was removed from the data set after the original data cleansing. Some individual cases were perhaps outliers, at least in a graphical sense, but none of them were influential enough to warrant removal from the statistical analysis.

Regarding missing values, when participants left a field empty during the online survey a reminder prompt appeared, in order to continue the participant either avoided answering a particular item by "clicking" that they wanted to continue without responding, or they had a second chance to complete the item and the survey continued as usual. Despite this measure there was still a total of four missing values that were assumed missing at random, and the expected maximization (EM) function in SPSS was used in accordance with the Missing Values Handbook provided by IBM for SPSS® Version 22 (2013).

Linear Regression Modeling

The simple linear regression and multiple linear regression methods that were used in model testing in the current study followed well-established best practice regression diagnostic guidelines, which are used to test the required assumptions prior to model specification. These assumptions include linearity between predictor(s) and outcome variables, homoscedasticity, normally distributed errors, and independent errors; these assumptions and effective methods for their thorough examination are discussed in detail in Field (2013),

UCLA: Institute for Digital Research and Technology (n.d.), Tran (2016), Bortz and Schuster (2016), and Tran (2017).

While checking the assumptions for the linear regression with teacher satisfaction as an outcome variable (see research question one), it became apparent that a data transformation was necessary to reduce the level of Skewness (-1.10) and Kurtosis (1.15) found during the analysis of residuals. The data were transformed using a Log-transformation, and all necessary precautions were taken as recommended by Field (2013) for such instances. The Log-transformation successfully reduced Skewness (-0.41) and Kurtosis (-0.64) to more tolerable levels (Field, 2013). The charts used to check this transformation graphically can be found in Appendix E. The rest of the data did not require transformation.

Mediation and Moderation Analysis

An examination of possible mediating or moderating variables can be telling, in that it can provide insight into relationships between variables that would otherwise go undetected. The two are similar in that they both deliver a clearer picture of a relationship between two variables, but they are two distinct phenomena. A moderator is a variable whose presence or absence affects the direction and/or strength of a relationship between a predictor and an outcome variable, whereas a mediator accounts for a specific proportion of a relationship between a predictor and an outcome variable, so moderator variables indicate when certain relationships will occur, while mediators indicate how and why such relationships occur (Field, 2013).

The methods used in examining relationships involving possible mediating or moderating variables were performed in line with Field (2013), Bortz and Schuster (2016), and Hayes (2012). The IBM SPSS® macro “Process” was used to perform the statistical mediation and moderation analyses (Hayes, 2012). Also, the *Kappa-Squared* (κ^2) statistic often reported in mediation analyses is intentionally not reported here, in part because it is no longer supported by the IBM SPSS® macro “Process,” but more importantly,

according to Hayes (2016) the original article that introduced κ^2 contains a mathematical error, and the use of a flawed κ^2 statistic is unreasonable. There are likely other methods to compute the κ^2 statistic and report it, but Hayes (2016) states that the fact that the κ^2 statistic should simply not be used, makes the question of how to compute it irrelevant.

5. Results

The statistic analysis was conducted with the assistance of IBM SPSS® Version 22 (2013). The first of seven brief scales presented to participants was the three item scale for *teacher satisfaction (TSat)*, which yielded the following: $Mean = 3.30$, $SD = 0.75$, and Cronbach's $\alpha = .705$. This was followed by the five item scale for *professional community (ProCom)*, which showed the following: $Mean = 2.93$, $SD = 0.85$, and Cronbach's $\alpha = .866$. Next, teacher collaboration was assessed with a three item scale that returned a $mean = 2.06$, $SD = 0.70$, and a problematic Cronbach's $\alpha = .565$ which resulted in the elimination of item two. The new two item *intensity of teacher collaboration* scale had a $mean = 2.66$, $SD = 0.88$, and Cronbach's $\alpha = .574$. The impact of this alteration will be further discussed in *section 5.1*. The five items scale for *general willingness to innovate (Innov8)* followed with a $mean = 1.91$, $SD = 0.53$, and Cronbach's $\alpha = .764$. Next, the twelve item implicit attitude scale *veiled SiA educational concepts (EdCon)* returned a $mean = 4.13$, $SD = 0.53$, and Cronbach's $\alpha = .833$. In turn, the five item *reactance to SiA* scale showed a $mean = 3.02$, $SD = 1.25$, and Cronbach's $\alpha = .871$. The final scale administered in the survey was the seven item *attitude towards SiA (At2SiA)* scale, which resulted in the following: $Mean = 2.99$, $SD = 1.10$, and Cronbach's $\alpha = .964$. *Table 2* contains additional descriptive statistics and a complete correlation matrix for all seven scales.

5.1 Predictors of teacher satisfaction

Hypothesis 1:

H_1 : *Professional community and intensity of teacher collaboration are related to teacher satisfaction.*

In an effort to examine the role of professional community and the intensity of teacher collaboration on teacher satisfaction the following analysis was conducted. Participants completed the *teacher satisfaction* scale from Stearns

et al. (2014), as well as both the *professional community* scale and the *intensity of teacher collaboration* scale found in Moller et al. (2011, 2013), Stearns et al. (2014, 2015), and Banerjee (2017). The initial examination of the scales' internal consistencies yielded the following acceptable values for the current sample: Teacher satisfaction: Cronbach's $\alpha = .71$ and professional community: Cronbach's $\alpha = .87$. On the other hand, intensity of teacher collaboration returned a low Cronbach's $\alpha = .565$ with an average inter-item correlation of .31, which due to the brevity of the scale (3 items) is reported here. The problematic internal consistency values found for *intensity of teacher collaboration* in the current study made the elimination of an item necessary. It turns out, if item two (*mean* = 0.86 and *SD* = 0.70), where 86.7% of respondents claimed "never" or "once a month or less," is eliminated from the *intensity of teacher collaboration* scale (Item two: *How often do teachers in your school meet to develop curriculum?*), the scale's internal consistency rises marginally to Cronbach's $\alpha = .574$ and has a stronger corresponding average inter-item correlation of $r = .404$. In addition, the correlation between intensity of teacher collaboration and teacher satisfaction spikes (nearly doubling) to a highly significant level with $r = .207$ and $p = .001$ (see *Table 2* for comparison to the original scale). Despite these improvements, the alteration of the original scale had no substantial affect on the linear model specification (see below). Nevertheless, the two-item version of the intensity of teacher collaboration scale was used in all remaining relevant analyses.

A correlation analysis showed that professional community and intensity of teacher collaboration are both significantly and positively correlated with teacher satisfaction, with $r = .335$, $p < .001$, and $r = .207$, $p = .001$, respectively. See *Table 2* for more details. The initial correlation analysis was expanded upon through the use of hierarchical linear regression (block-wise entry) modeling, which was used to simultaneously examine the possible relationships between the outcome variable teacher satisfaction and the predictors: Perception of professional community and perceived intensity of teacher collaboration.

Table 2: Correlation Matrix and Descriptive Statistics for all Scales

Measure	1	2	3	4	5	6	7
1. TSat	—						
2. ProCom	.335 ^{***}	—					
3. TCollab	.106	.394 ^{***}	—				
4. Innov8	.331 ^{***}	.127 [*]	.117	—			
5. EdCon	.152 [*]	.082	.056	.390 ^{**}	—		
6. React	-.230 ^{***}	-.192 ^{**}	-.003	-.484 ^{***}	-.349 ^{***}	—	
7. At2SiA	.209 ^{***}	.077	-.021	.444 ^{***}	.522 ^{***}	-.669 ^{***}	—
<i>M</i>	3.30	2.93	2.06	1.91	4.13	3.02	2.99
<i>M%</i>	72.1	73.2	51.5	63.6	82.3	50.3	59.8
<i>SD</i>	0.75	0.85	0.70	0.53	0.53	1.25	1.10
<i>SD%</i>	24.4	21.3	17.5	17.6	10.7	20.7	21.9

*Note: Significance levels: * $p < .05$, ** $p < .01$, *** $p < .001$; *M%* and *SD%* are based on a scale transformation to percentage of the scale, which creates a common scale for comparison of means between the various Likert scales. For ease of comparison, the untransformed mean and standard deviation of teacher satisfaction are reported here. However, the correlation values were calculated with the log transformed data.*

The regression analysis was conducted in two steps: Step one illustrates the relationship between the perception of professional community and teacher satisfaction. The effect size as a result of perception of professional community's inclusion to the model is $F\Delta = 31.07$ and an explained variance of $R\text{-Square} = .112$. Step one reaches significance at $p = .001$. In step two intensity of teacher collaboration is added to the model as the second predictor. This addition yields a $F\Delta = 1.86$, and $\Delta R\text{-Square} = .007$. Intensity of teacher collaboration again fails to reach significance with $p = .174$. These statistical values led to the exclusion of intensity of teacher collaboration as a predictor in the linear regression model for the outcome variable teacher satisfaction. The complete model specification is in *Table 3*.

Table 3: Hierarchical Model for Predictors of Teacher Satisfaction

	<i>b</i>	<i>SE B</i>	β	<i>p</i>
Step 1:				
Constant	.308 (.236, .380)	.037		<i>p</i> = .001
ProCom	.067 (.043, .091)	.012	.335	<i>p</i> = .001
Step 2:				
Constant	.286 (.207, .365)	.040		<i>p</i> = .001
ProCom	.058 (.032, .085)	.014	.291	<i>p</i> = .001
TCollab	.018 (-.008, .044)	.013	.093	<i>p</i> = .174

Note: R-Square = .112 for step 1; ΔR -Square = .007 for step 2. Also, $F\Delta = 31.07$ in step 1; $F\Delta = 1.86$ in step 2. Further 95% bias corrected and accelerated confidence intervals are in parentheses. Confidence intervals are based on 1000 bootstrap samples.

Consequently, the first hypothesis (H_1) can only be partially confirmed. When taken separately, there is a significant relationship between the perception of professional community and teacher satisfaction, and between the intensity of teacher collaboration and teacher satisfaction, but when this relationship is modeled using hierarchical linear regression it turns out that intensity of teacher collaboration no longer plays a meaningful enough role in teacher satisfaction to reach significance.

5.2 Teacher satisfaction and general willingness to innovate

Hypotheses:

H₂: Teacher satisfaction is associated with general willingness to innovate.

H_{2a}: Given H₂, professional community will play a moderating role in the relationship between teacher satisfaction and general willingness to innovate.

H_{2b}: Given H₂, professional community will play a mediating role in the relationship between teacher satisfaction and general willingness to innovate.

H_{2c} : Given H_2 , intensity of teacher collaboration will play a moderating in the relationship between teacher satisfaction and general willingness to innovate.

H_{2d} : Given H_2 , intensity of teacher collaboration will play a mediating in the relationship between teacher satisfaction and general willingness to innovate.

In order to investigate the possible relationship between teacher satisfaction as a predictor of *general willingness to innovate*, as well as the possible moderating/mediating variables involved in this proposed relationship, participants' responses to the *general willingness to innovate* scale from Emmrich (2009), in addition to the *teacher satisfaction* scale from Stearns et al. (2014), the *professional community* scale and the *intensity of teacher collaboration* scale found in Moller et al. (2011, 2013), Stearns et al. (2014, 2015), and Banerjee (2017), were examined. A preliminary examination of the scale's internal consistency yielded a satisfactory Cronbach's $\alpha = .87$. The internal consistencies of the remaining scales mentioned above were previously discussed in section 5.1.

Table 4: Teacher Satisfaction predicting Willingness to Innovate

	<i>b</i>	<i>SE B</i>	β	<i>p</i>
Step 1:				
Constant	1.39 (1.19, 1.59)	.10		$p = .001$
Teacher Satisfaction	1.03 (0.66, 1.40)	.19	.33	$p = .001$

Note: R-Square = .109, Adjusted R-Square = .106, $F\Delta = 30.19$, and $p < .001$. Also, 95% bias corrected and accelerated confidence intervals are in parentheses. Confidence intervals are based on 1000 bootstrap samples.

The statistical analysis began with a simple correlation analysis, which yielded a highly significant correlation between *teacher satisfaction* and *general willingness to innovate* ($r = .331$, $p < .001$). This was followed by a linear regression analysis, which successfully modeled teacher satisfaction as a

predictor of teacher's general willingness to innovate, and revealed an effect size of $F = 30.19$ and an explained variance of $R\text{-Square} = .109$. The proposed model reached a high level of significance with $p < .001$. See *Table 4* for the complete model specification.

With the relationship between *teacher satisfaction* and *general willingness to innovate* established, the analysis continued with the assistance of Hayes' (2012) SPSS Macro which simplified the examination of the perception of professional community and intensity of teacher collaboration for possible mediating and moderating effects involved in the relationship between teacher satisfaction and general willingness to innovate. It turned out that neither the examination of perception of professional community, nor the intensity of teacher collaboration yielded significant mediating or moderating interactions in the relationship between teacher satisfaction and general willingness to innovate, as seen in the model specifications below.

A moderation analysis for the interaction between perception of professional community and teacher satisfaction shows a $b\text{-value} = 0.13$ $[-0.24, 0.49]$, $\Delta R\text{-Square} = .002$, $F = 0.46$, and $p = .50$. The moderation analysis for the interaction between perceived intensity of teacher collaboration and teacher satisfaction, on the other hand, shows a $b\text{-value} = -0.27$ $[-0.74, 0.19]$, $\Delta R\text{-Square} = .005$, $F = 1.32$, and $p = .25$. In both instances, the 95% confidence intervals for the $b\text{-value}$ include zero, the $\Delta R\text{-Square}$ is negligible, and the $p\text{-value}$ is non-significant. These values consistently indicate that the proposed moderating effects between *teacher satisfaction* and willingness to innovate are not present.

The first mediation analysis revealed no significant indirect effects of teacher satisfaction on general willingness to innovate through perception of professional community, $b = 0.02$, BCa CI $[-0.12, 0.16]$. The Sobel-test for indirect effects is non-significant with $b = 0.02$, $p = .78$. A second mediation analysis showed no significant indirect effects of teacher satisfaction on

general willingness to innovate through perceived intensity of teacher collaboration, $b = 0.03$, BCa CI $[-0.01, .13]$. The Sobel-test for indirect effects is non-significant with $b = 0.03$, $p = .34$. In both mediation analyses above: Small b -values, bootstrapped 95% confidence intervals that include zero, and non-significant Sobel tests indicate the absence of a mediating effect. As was the case with the moderation analysis, the values found here indicate that the proposed mediating effects between *teacher satisfaction* and willingness to innovate remain unseen in the current sample.

The primary hypothesis (H_2) proposed in this section was confirmed by both simple correlation analysis and linear regression modeling, meaning that teacher satisfaction was indeed found to be a predictor of general willingness to innovate. On the other hand, moderation and mediation analyses regarding both professional community and intensity of teacher collaboration, consistently failed to confirm any of the proposed links ($H_{2a} - H_{2d}$) to the interaction between teacher satisfaction and general willingness to innovate as mediating or moderating variables, which means that neither the very presence of, nor the level of professional community or intensity of teacher satisfaction are able to explain or account for aspects of the relationship between teacher satisfaction and general willingness to innovate.

5.3 General willingness to innovate and reactance

Hypotheses:

H_3 : General willingness to innovate is associated with reactance to a real, uncontrived, and specific reform.

H_{3a} : Given H_3 , implicit agreement with the educational concepts behind a reform plays a moderating role in the relationship between general willingness to innovate and reactance to a real, uncontrived and specific reform.

H_{3b} : Given H_3 , implicit agreement with the educational concepts behind a reform plays a mediating role in the relationship between general willingness to innovate and reactance to a real, uncontrived and specific reform.

In order to look into the relationship between teacher's general willingness to innovate, reactance to a real, uncontrived, and specific reform (e.g. "Schule im Aufbruch"), and implicit attitudes towards a specific reform, participant responses to the following scales were examined: Emmrich's (2009) *general willingness to innovate* scale (Cronbach's $\alpha = .76$), Ungar et al.'s (2015) adapted *reactance to SiA* scale (Cronbach's $\alpha = .87$), and the newly constructed *veiled educational concepts* (implicit attitudes) scale (Cronbach's $\alpha = .83$).

The inquiry into the relationship between general willingness to innovate and reactance to SiA started with a simple correlation analysis, which returned a highly significant negative correlation between teacher's general willingness to innovate and teacher's reactance to SiA with $r = -.484$ and $p < .001$ (see *Table 2*). In a further step the association between general willingness to innovate and reactance to SiA was successfully modeled using simple linear regression ($F = 75.24$, $R\text{-Square} = .231$, and $p = .001$). The complete model specification can be found in *Table 5*.

Table 5: Willingness to Innovate as a Predictor of Reactance

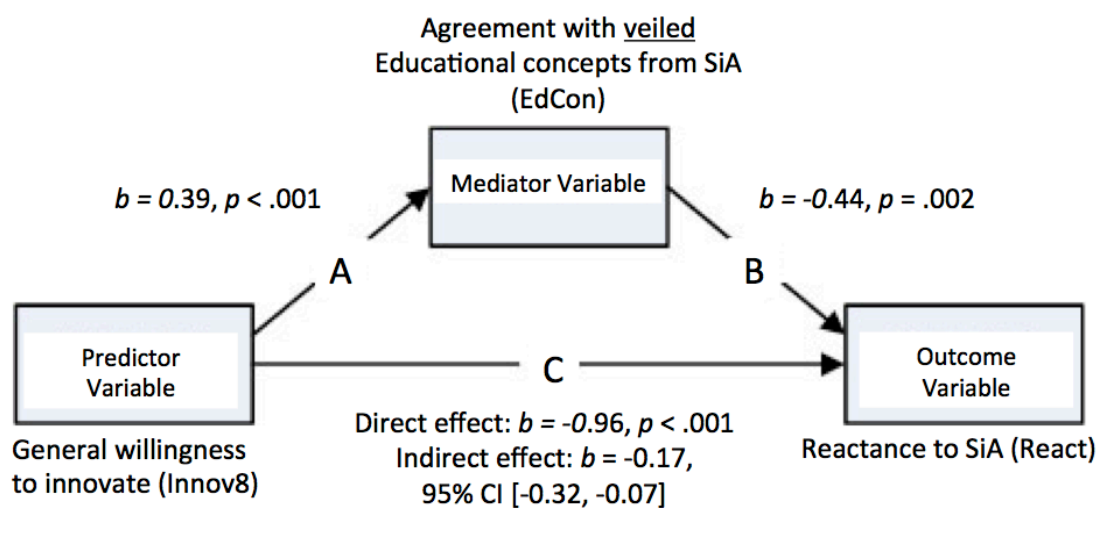
	<i>b</i>	<i>SE B</i>	β	<i>p</i>
Step 1:				
Constant	5.18 (4.67, 5.69)	.26		$p = .001$
Willingness to innovate	-1.13 (-1.39, -0.88)	.13	-.48	$p = .001$

Note: R-Square = .234, Adjusted R-Square = .231, F = 75.24, and p-values < .001. The 95% confidence intervals are in parentheses. Confidence intervals are based on 1000 bootstrap samples.

After the relationship between willingness to innovate and reactance to SiA was confirmed, a moderation and mediation analysis was conducted per Hayes (2012). The moderation analysis for the interaction between *attitude towards veiled educational concepts* and *general willingness to innovate*

yielded no significant effects. The interaction shows a *b-value* = 0.08, CI [-0.35, 0.50], and *p* = .71. The interaction's effect size is also minimal with a $\Delta R\text{-Square}$ = .0004, and *F* = 0.14. These minimal interaction values and the 95% confidence interval containing zero indicate that *attitudes towards veiled educational concepts* have no moderating role in the relationship between general willingness to innovate and reactance to “Schule im Aufbruch,” which means that the level of implicit attitudes towards SiA (via veiled items that revealed what teachers thought about the educational concepts behind the “Schule im Aufbruch” initiative) did not play a consequential role in the relationship between general willingness to innovate and reactance to SiA.

Figure 1: Mediated Relationship between Willingness to Innovate and Reactance to “Schule im Aufbruch”



Note: Sobel normal theory tests for indirect effect: effect = -0.17 , $p = .005$

On the other hand, it turns out that *agreement with veiled educational concepts* (implicit attitudes towards SiA) does indeed have a mediating role in the relationship between general willingness to innovate and reactance to “Schule im Aufbruch.” This means that the particular level of implicit attitudes towards SiA does not play a role in dictating the level of reactance to SiA, but instead is able to explain part of the relationship between general willingness to innovate and reactance to SiA. More specifically, Hayes’ (2012) SPSS

macro revealed a significant indirect effect of willingness to innovate on reactance to SiA through attitude towards veiled educational concepts (implicit attitude towards SiA), $b = -0.17$, BCa CI $[-0.32, -0.07]$. See *Figure 1* for the complete mediation model specification.

The main hypothesis (H_3) put forth in this section was confirmed with a combination of simple correlation analysis and linear regression modeling. As a result general willingness to innovate was found to be a predictor of reactance to SiA in the current sample. More specifically, the negative correlation between the two shows that higher levels of general willingness to innovate are linked to lower levels of reactance and vice versa. Regarding the remaining two hypotheses, H_{3a} must be rejected given the lack of support found in the moderation analysis; in short, the level of agreement with the veiled educational concepts of SiA had no affect on the magnitude of reactance to SiA. In contrast, H_{3b} was confirmed by the mediation analysis, which indicated that agreement with veiled educational concepts behind SiA indeed plays a mediating role in the relationship between general willingness to innovate and reactance to SiA.

5.4 Reactance and attitude towards “Schule im Aufbruch”

Hypotheses:

H_4 : Reactance to a real, uncontrived, and specific reform is associated with explicit negative attitudes towards the reform.

H_{4a} : Given H_4 , implicit agreement with the educational concepts behind the reform play a moderating role in the relationship between reactance to a real, uncontrived, and specific reform and explicit negative attitudes towards the reform.

H_{4b} : Given H_4 , implicit agreement with the educational concepts behind the reform plays a mediating role in the relationship between reactance to a real, uncontrived, and specific reform and explicit negative attitudes towards the reform.

An examination of the relationship between teachers' reactance to a real, uncontrived, and specific reform (e.g. "Schule im Aufbruch"), explicit attitudes towards SiA, and implicit attitudes towards SiA in the current sample necessitated the inclusion of the following scales: Ungar et al.'s (2015) adapted *reactance to SiA* scale (Cronbach's $\alpha = .87$), Shen and Dillard's (2005) attitudinal scale adapted for "Schule im Aufbruch" (Cronbach's $\alpha = .96$), and the newly constructed *veiled educational concepts* (implicit attitudes) scale (Cronbach's $\alpha = .83$).

The analysis of the proposed relationship between teacher's reactance to "Schule im Aufbruch" and teacher's explicit attitudes towards "Schule im Aufbruch" began with a simple correlation analysis, which yielded a highly significant negative correlation between teacher's reactance to SiA and teacher's attitudes towards SiA, whereby $r = -.67$ and $p < .001$. See *Table 2* for more details. The analysis continued by applying simple linear regression modeling, which served to further cement the relationship between reactance to SiA and explicit attitudes towards SiA; this relationship was successfully modeled using linear regression ($F = 199.70$, $R\text{-Square} = .45$, and $p < .001$). The complete model specification is available in *Table 6*.

Table 6: Reactance as a Predictor of Explicit Attitudes towards SiA

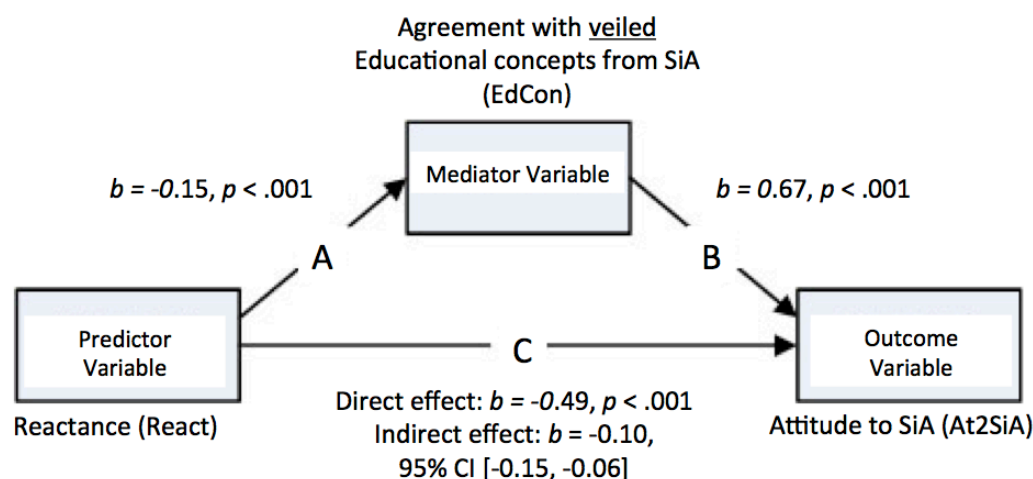
	<i>b</i>	<i>SE B</i>	β	<i>p</i>
Constant	4.77 (4.50, 5.04)	.14		$p = .001$
Reactance to SiA	-0.59 (-0.67, -0.51)	.04	-.67	$p = .001$

Note: R-Square = .45, Adjusted R-Square = .45, F = 199.70, p < .001

Following the linear model specification, moderation and mediation analyses were conducted to examine the possible influence of implicit attitudes towards SiA on the already established relationship between reactance to SiA and

explicit attitudes towards SiA. A moderation analysis, which examined *agreement with veiled educational concepts* from SiA (implicit attitudes towards SiA) as a possible moderating variable did not indicate a significant moderating effect on the relationship between reactance to SiA and explicit attitudes towards SiA. The interaction shows a *b-value* = 0.05, CI [-0.09, 0.18], and *p* = .50. The interaction's effect size is miniscule with a $\Delta R\text{-Square}$ = .0009, and *F* = 0.46. These minimal values and a confidence interval that contains zero indicate that the level of implicit attitudes towards SiA do not play a significant role in the magnitude of explicit attitudes towards SiA.

Figure 2: Veiled Educational Concepts mediating the Relationship between Reactance to “Schule im Aufbruch” and Attitude towards “Schule im Aufbruch”



Note: Sobel normal theory tests for indirect effect: effect = $-0.10, p < .001$

In stark contrast, the mediation analysis, which investigated the affect *attitude towards veiled educational concepts* has on the relationship between *reactance to SiA* and *explicit attitude towards SiA*, yielded a significant indirect effect. This means that teachers' implicit attitudes towards the concepts behind SiA do indeed play a role in the relationship between reactance to SiA and explicit attitudes towards SiA, albeit a small one. More specifically, about a fifth of the relationship discussed here can be attributed to the significant indirect effect of *reactance to SiA* on *explicit attitude towards SiA* through

agreement with veiled educational concepts, $b = -0.10$, BCa CI $[-0.15, -0.06]$. The specification in its entirety is in Figure 2.

The main hypothesis (H_4) examined in this section was confirmed in two steps, first by simple correlation analysis, and then via linear regression modeling, which together indicate that teacher reactance to SiA was found to be a predictor of explicit teacher attitudes towards SiA. As a result, increasing levels of reactance to SiA are associated with decreasing explicit attitudes towards SiA and vice versa. Regarding the final two hypotheses, H_{4a} must be rejected given the lack of supporting evidence to indicate that the level of implicit attitude towards SiA determines the magnitude of the outcome in the relationship between reactance to SiA and explicit attitude towards SiA. In contrast, H_{4b} was confirmed by the mediation analysis, which showed that agreement with the veiled educational concepts behind SiA plays a mediating role in the relationship between reactance to SiA and explicit attitudes towards SiA.

6. Discussion

Summary of results

The purpose of this scientific inquiry from the onset was to promote the use of evidence-based practices in the context of educational reforms, while also investigating possible links between factors that encourage and support the success of educational reforms that could be used in educational reform pre-implementation screening. If factors associated with successful reforms proved to be predictive, measurable and malleable then it would be critical that those initiating reforms use pre-implementation survey instruments, such as the ones used in the present study, to determine if a school is ready for a particular reform. Ideally, schools that indicate more “readiness” would begin with the scheduled reform, while schools that signaled less “readiness” would undergo professional development until their proverbial soil was ready for planting, or at a bare minimum, reform initiators could initially cast a wide net in order to filter out the schools that have the lowest levels of “readiness” which would at the very least reduce the amount of precious resources wasted as a result of the reform implementation.

Now, in order to grant the current research credibility and to lend it real world value in an educational reform context, access to a real and uncontrived reform initiative was indispensable. SiA is just such an initiative, and its inclusion was crucial to the current paper’s ability to draw conclusions regarding reform efforts and reform implementation.

The current sample of 248 NMS teachers in Lower Austria made an investigation of the present research questions possible, and in many cases provided new insight into important topics in educational reform or further cemented relationships that have been in the literature for years.

The present research confirmed the relationship between professional community and teacher satisfaction, but the relationship suggested in the literature between intensity of teacher collaboration and teacher satisfaction remained unseen in the scales original constellation, which indicates that aspects like an effective leadership, shared school mission, a sense of belonging, school spirit, etc. are more crucial to teacher satisfaction than the mere intensity of teacher collaboration. In addition, the current study also found an important connection between teacher satisfaction and general willingness to innovate; this means that teachers that are happy with their career choice, experience self-efficacy and satisfaction in school are more likely to be open to the types of changes at work that accompany educational reform efforts.

Further, general willingness to innovate is not only associated with teacher satisfaction, but its link to psychological reactance was also established, and not just in a laboratory setting, but instead by taking advantage of a real and uncontrived reform taking place in schools all over Lower Austria. In this case, however, implicit attitudes towards the reform's (SiA) basic principles proved to be a mediating factor in the relationship between general willingness to innovate and psychological reactance. The mediation analysis showed that a teacher's feelings towards a reform's basic concepts only play a minor role in the relationship between general willingness to innovate and reactance. The association between reactance to reform (SiA) and the accompanying attitude towards the reform is highly significant and represents the strongest effect in the study overall. Here, additional analysis also revealed a mediating effect from implicit attitudes towards the reform. This, for the second time, suggests that how teachers actually feel about a reform's basic principles only plays a minor role in the resulting attitudes towards the reform.

Lastly, a word about correlative data: the correlative nature of the data discussed here makes it impossible to make definitive claims of direct causation, but examining the correlative data at hand in the context

established by current literature makes the relationships implied here reasonable, including the assumptions made regarding the direction and magnitude of the relationships observed and reported in the current study. A more detailed discussion of the individual research questions and hypotheses follows.

6.1 Predictors of teacher satisfaction

A simple correlation matrix (see *Table 2*) shows that in the current sample professional community's relationship to teacher satisfaction is highly significant, in contrast to teacher collaboration in its original three-item format, which proved to have a non-significant association with teacher satisfaction. The two-item version of the intensity of teacher collaboration scale, however, managed to reach significance, but still remained weaker than its professional community counterpart. Given the results reported by Stearns et al. (2014, 2015) and Banerjee et al. (2017), these initial results were not surprising, considering that professional community consistently outperformed teacher collaboration in predicting teacher satisfaction in the source literature. The hierarchical linear regression model specification confirmed suspicions raised by the initial correlation matrix. According to the model specification teacher collaboration did not have enough predictive influence to justify inclusion in the linear model, leaving professional community as the lone predictor of teacher satisfaction in the current model.

This indicates, as did Stearns et al. (2014, 2015) and Banerjee et al. (2017), that teachers that enjoy teaching, believe they are making a difference, and have no regrets in their career choice are more likely to have higher levels of school spirit, feel accepted and respected as a colleague, and be more receptive to learning new things; in addition, these satisfied teachers are likely to be in schools where leadership has successfully communicated clearly defined goals that their teachers find agreeable and support. This means that reform initiators that want to foster the myriad of correlates affiliated with higher levels of teacher satisfaction (e.g. higher levels of reform commitment, greater confidence in reforms, increases student achievement, decreased

occupational stress, decreased absenteeism, decreased turnover, etc.) should focus on improving aspects of professional community in their institution(s) (MetLife Inc., 2013; Stearns et al., 2014, 2015; Banerjee, 2017).

As previously reported, the second item's removal from the intensity of teacher collaboration scale made the scale more internally consistent and more predictive of teacher satisfaction, and this indicates that this particular item is a source of bias. The most likely scenario, according to the author, is that "curriculum development" is not really happening in schools with much variation at all, as 86.7% of participants responding with "never" or "once a month or less" would certainly suggest. If the item is supposed to indicate intensity of teacher collaboration, but in reality it only contributes a systematic bias, then it must be removed or replaced in future studies.

A more benign interpretation of this lack of variation could be the fact that the government established school curriculum for Lower Austria does not change annually, which could lead to teachers and schools taking the same approach year to year with perhaps only minor changes. In contrast, the other two items, which refer to the frequency of collaboration on lesson planning and frequency of meetings to discuss particular student needs, offer more room for variation and are logically prone to higher frequencies of collaboration.

Another possibility, but far less plausible explanation is that the word "Lehrplan," which translates to "curriculum," can also mean "lesson plan" in some contexts. In that case, the expectation would be that the first and second item responses would have been very similar, and that is simply not the case.

A final comment on intensity of teacher collaboration, teacher collaboration does not necessarily always have to be a positive experience, which some literature fails to recognize, and in those cases the more interactions might actually lead to lower levels of satisfaction. An additional item in the scale that

attempts to filter out this experience may help to add clarity and in the end help to optimize the scale.

6.2 Teacher satisfaction and general willingness to innovate

The relationship between teacher satisfaction and general willingness to innovate has received far less attention in the literature than the link between general willingness to innovate and successful reform efforts, which has found overwhelming support in the literature (Burkard & Kanders, 2002; Holtappels, 2004; Holtappels & Rollet, 2009; Emmrich, 2009; & McElvany et al., 2013). However, despite the shortage of source material the association between teacher satisfaction and general willingness to innovate was at the very least implied by Emmrich (2009) and MetLife Inc. (2013). The results of a linear model specification in the current study found a highly significant relationship between teacher satisfaction and general willingness to innovate. In addition, this relationship was not moderated or mediated by professional community or teacher collaboration; this was not surprising considering the strong relationship between professional community and teacher satisfaction, and the relatively weak relationship between professional community and general willingness to innovate (see *Table 2*). Even less surprising were the results of the moderation/mediation analyses for the intensity of teacher collaboration; teacher collaboration is not even significantly related to general willingness to innovate, so it had no chance of being a moderator or mediator from the onset (see *Table 2*).

The relationship established here suggests that reform initiators that are interested in increasing general willingness to innovate in order to increase the likelihood of a reform's success should focus on efforts to foster teacher satisfaction, which necessitates a clear focus on developing schools with effective leadership, a shared mission, and a collegial and respectful school environment where teachers have school spirit, feel that they belong, and have plenty opportunities for professional development.

In addition, reformers could use this information as part of a pre-implementation litmus test to determine if a particular school is “ready” for a specific reform. In cases where schools are “ready” from the onset implementation can begin immediately, but in schools where the test indicates certain deficiencies professional development efforts may need to take priority in the short-term before reform implementation can begin. This approach would likely encourage more productive, successful, and lasting reforms.

6.3 General willingness to innovate and reactance

General willingness to innovate has been consistently linked to successful reform efforts, but the relationship between general willingness to innovate and psychological reactance to a real and uncontrived reform represents a gap in the literature that warranted pursuing (Burkard & Kanders, 2002; Holtappels, 2004; Holtappels & Rollet, 2009; Emmrich, 2009; & McElvany et al., 2013).

The relationship between general willingness to innovate and reactance to reform ($r = -.484$) is highly significant and has serious implications for educational reforms. The relationship indicates that as general willingness to innovate increases reactance to the reform decreases. This means that during reform processes schools that indicate higher levels of general willingness to innovate are less likely to experience reactance, and the negative consequences that generally accompany psychological reactance, including undesirable changes in personal intentions and behaviors regarding efforts to persuade and affect change, while schools that indicate lower levels of general willingness to innovate are more susceptible to reactance and its associated negative outcomes (see Brehm, 1966; Dillard & Shen, 2005; Miron & Brehm, 2006; Traut-Mattausch et al., 2008; Nesterkin, 2013; Steindl et al., 2015; Ungar et al., 2015). If this is the case then reform initiators need to especially pay close attention to levels of general willingness to innovate, because it appears to function as a buffer against reactance to reforms, which in turn reduces the consequences related to its emergence.

Of course this correlational relationship could also be interpreted in the opposite direction, meaning that one could also infer that increased reactance is associated with a decrease in general willingness to innovate, and the lack of corroborating literature to support the direction proposed here makes considering both possible directions necessary. Fortunately for the present research, the very notion of the second proposed direction is rather illogical; the idea that reactance to a specific reform can cause a global change in an individual, as with *general* willingness to innovate, is highly unlikely. This can in part also be explained by the very nature of reactance, psychological reactance is a temporary state to a specific freedom threat, not an enduring personal characteristic, so when the freedom threat subsides reactance also subsides. The suggestion that this temporary state can induce a decrease in general willingness to innovate seems improbable.

On the other hand, an argument can be made on the grounds of *willingness to innovate's* malleability, considering that it develops over time through a series of specific experiences, both positive and negative, and that the most current experiences in the workplace could, assumedly, affect one's current *general willingness to innovate* more than experiences that occurred in the past. This means that a strong reaction to a current reform (positive or negative) would likely influence teachers' current *general willingness to innovate*, and in-turn artificially boost the correlation between *general willingness to innovate* and *reactance to a specific reform*. This argument makes it all the more critical to avoid priming participants during data collection. To this end, in the current study every effort was made to avoid references to the school initiative "Schule im Aufbruch" and as a consequence the *reactance to SiA* scale and *explicit attitudes towards SiA* scale came at the end of the study, which renders the argument that the relationship between *general willingness to innovate* and *reactance to SiA* may have been influenced by a priming effect from the reactance to SiA items moot.

In addition to the main effect discussed above, a mediating effect was also uncovered. Teachers' *implicit attitudes towards SiA's basic concepts* were investigated as a possible moderator/mediator in the relationship between general willingness to innovate and reactance to the reform. The mediation analysis was significant, which has some important implications. It turns out that a teacher's implicit feelings about a reform's basic principles actually only play a relatively small role in the emergence of reactance, which nullifies the argument that the "real" problem in the relationship between general willingness to innovate and reactance to SiA is the lack of teacher agreement with SiA's basic concepts. This result also runs counter to the logical assumption that agreement with a particular reform's basic concepts might function as a thick cushion against negative outcomes stemming from either a lack of general willingness to innovate or an excess of reactance to reform, but that simply does not seem to be the case. This is emphasized by the fact that only 17.7% of the total effect between general willingness to innovate and reactance to SiA is linked to the teacher attitudes towards SiA's basic concepts.

6.4 Reactance and attitude towards "Schule im Aufbruch"

Research in psychological reactance consistently indicates the severity of the negative consequences involved with psychological reactance in persuasion attempts and attempts at policy reform; psychological reactance generally leads to undesirable changes in personal attitudes, intentions and behaviors among those affected by the reform (Brehm, 1966; Dillard & Shen, 2005; Miron & Brehm, 2006; Traut-Mattausch et al., 2008; Nesterkin, 2013; Steindl et al., 2015; Ungar et al., 2015). The current study, consistent with reactance theory, showed that increases in psychological reactance are strongly associated ($r = -.669$ and $p < .001$) with negative shifts in attitude towards a reform. This relationship is extremely meaningful for those intending to initiate reform, because it means that if the reform implementation process arouses reactance, teacher attitudes and intentions towards the reform are likely to decline, which eventually leads to decreased effort and commitment to appropriately implement the reform. Ironically, according to reactance theory

teachers that were originally the strongest supporters of the reform are at the greatest risk of experiencing psychological reactance; this boomerang effect causes even more reactance in those that are actually the most supportive of the reform, which brings about obvious negative consequences (Brehm, 1989; Herkner, 2001). This emphasizes the need for careful and sensitive reform implementation, and underscores the importance of teachers in the reform process, because without satisfied and committed teachers real change through reform will be difficult, because at the end of the day teachers are also the reform implementers (Lee et al., 1991; Ma & MacMillan, 1999).

In addition to the main effect between psychological reactance to a particular reform and teacher attitudes towards the particular reform, a moderation/mediation analysis revealed that teacher's implicit attitudes towards SiA's basic concepts played a mediating role in the relationship between psychological reactance and teacher attitudes towards the reform. Naturally, this comes with some implications that must be considered by those intending to initiate reform. Most importantly, the role of implicit attitudes towards veiled SiA basic concepts as a mediator indicates that these attitudes only make up about 20% of the overall effect between psychological reactance and explicit attitudes towards the reform. This means that how teachers actually feel about a reform's basic concepts only plays a small role in their formation of attitudes towards the reform. It may seem logical to assume that agreement with a particular reform's foundational concepts might provide some type of durable buffer against negative outcomes stemming from reactance, but that simply does not seem to be the case. This mediating effect, as was also the case with the previously discussed mediation above, nullifies the argument that the "real" problem in the reform process is that teachers do not believe in the basic concepts of the reform, but instead indicates that observed problems with attitudes, intentions, and behaviors regarding the implementation of the reform are influenced by psychological reactance as a result of overly forceful or otherwise insensitive reform implementation.

7. Limitations

Like all scientific endeavors, this study was not without its limitations. First, the sample: A good faith effort was made to contact all of the public NMS schools in Lower Austria during the recruitment phase, during which principals self-selected to either involve their school in the current study or not, which means that we are certainly not dealing with a completely random sample. Also, like the majority of voluntary questionnaire based research, the teachers that participated in the current study also self-selected and self-reported, which creates a second layer of possible self-selection bias in the current study, and again points out that the current sample cannot be considered entirely random or free of bias. Self-selection bias is troublesome because if participating principals and teachers are fundamentally different from those that did not self-select, then it becomes impossible to make either claims of representativeness or inferences regarding the population.

The recruitment messages used in the current study, however, purposely did not mention SiA in an effort to not preferentially sample those that have feelings for SiA in one way or another; the frequency statistics for reactance to SiA indicate that this strategy was successful (see Appendix F).

Next, the timing of the survey: The survey may have returned stronger results regarding reactance if the survey had been conducted in the 2015/2016 school year when more was being done in terms of information dissemination and early implementation activities. Since psychological reactance is a state in response to a freedom threat and not a trait, it is entirely possible that whatever reactance originally emerged had since dissipated as a result of the waning freedom threat, meaning that in schools that either never adopted the initiative or have already dropped the program would no longer see SiA as a freedom threat, which could explain the sample's tendency towards the neutral response in the reactance scale. To combat this possibility respondents were asked to think back to their experiences regarding SiA in an effort to reactivate their feelings. Another possibility, however, is that this

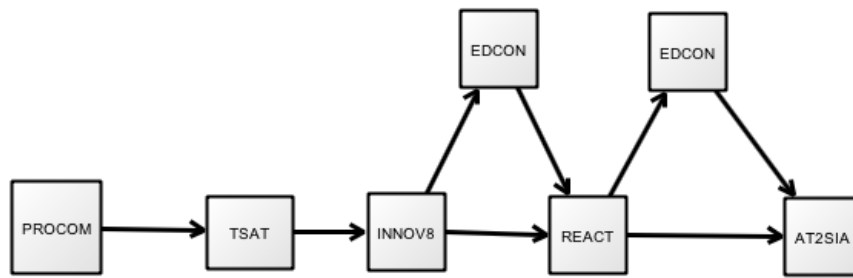
tendency came from a lack of knowledge about the program, which seems less likely due to the amount of attention SiA received from leadership, the press, and the local teaching college. If, for whatever reason, this were the case then the expectation would be that the items in the reactance scale, which were all on the same page, would have been more likely to be skipped, or even a marked spike in respondent attrition during this section would have been noticeable at this point than on other pages of the survey, both of which were not the case.

Lastly, due to the non-standardized implementation of the SiA initiative the nature of the individual school level implementations and individual teacher experiences were likely very heterogeneous, meaning that teachers in a school that attempts to do everything may have different feelings about the program than teachers in a school that only adopted and adapted a bare minimum of the principles, which means the connections found involving reactance and attitude towards reform should be re-examined during the implementation of a more standardized reform effort.

8. Recommendations for future research

Despite the knowledge gained by the current research, there are still numerous opportunities for further investigation. Most urgently, if the importance of intensity of teacher collaboration regarding teacher satisfaction is going to continue to find favor in the literature then the current scale for intensity of teacher collaboration needs to be reworked, if not entirely re-conceptualized and re-established on a new sample. Its weakness in a number of contexts, including here, is suspicious given the amount of support it appears to have in the source literature (Stearns et al., 2014, 2015; & Banerjee et al., 2017). Also, the fact that collaboration may not always be a positive experience is not accounted for in the current study. Further research should also include a scale pertaining to quality of teacher collaboration, and not solely rely on the intensity of teacher collaboration.

Figure 3: Model Suggestion for possible Structural Equation Modeling



Note: The structural equation model pictured above creates an overarching model out of the individual interactions between professional community (PROCOM), teacher satisfaction (TSAT), general willingness to innovate (INNOV8), reactance to a specific reform (REACT), and implicit (EDCON) & explicit (AT2SIA) attitudes towards the reform that were investigated and reported in the current study

In addition, given the current results, the model in *Figure 3* deserves to be investigated using a longitudinal experimental design with a large sample, and evaluated via structural equation modeling (SEM). This paper has confirmed the individual steps, but SEM would be able to test the model as one overarching concept. If successful, such an examination would cement the importance of professional community as the primary source of successful educational reforms.

In addition, any further research should attempt to increase the amount of randomness in the study, because the current study is based on two waves of self-selection: First, school leadership self-selected if their school would participate or not, and then the individual teachers self-selected if they participated or not. This is especially problematic if particular characteristics or variables of interest cause respondents to self-select. For example, in studies with self-selection it could be that those that choose to participate are generally more satisfied with work, more open to reform, and come from schools with stronger professional cultures than non-respondents. This for obvious reasons has the potential to create a lot of room for bias and complicates the examination of causal/correlative relationships. This bias could be reduced in the following way. Ideally, a partner like a school authority

would allow random selection of schools in a particular region and then disseminate the survey link centrally to ensure that all would-be respondents receive the invitation to participate.

Finally, considering the integral role professional community plays in the posited model above, and considering the role that school leadership plays in professional community, further research should examine what other contributions school leaders make towards a school's professional community outside of establishing a school mission and winning teacher approval and support for the mission (as operationalized here). This could lead to a different reform strategy that does not aim specifically at thousands and thousands of teachers, but instead at hundreds of school leaders with the goal of ensuring quality school leadership, which in-turn cultivates strong professional community, and all that comes with it.

9. Conclusion

This paper aimed at promoting evidence-based practices in educational reform efforts, and to ultimately offer education reform initiators an instrument derived from evidence-based practices to use during pre-implementation to help them better understand the schools they intend on reforming. To this end, a number of predictors, drawn from the literature and already linked to successful educational reforms, were examined, including teacher satisfaction, professional community, intensity of teacher collaboration, and general willingness to innovate. The literature was partly confirmed by teacher satisfaction's relationship with professional community and intensity of teacher collaboration. The latter, in its original form, was unable to reach significance, but this was not surprising given the auxiliary role intensity of teacher collaboration appears to play in the literature. This showed that dimensions at the school level, like effective leadership, shared goals, respect, sense of belonging, etc. were actually far more important than a simple measure of how frequently teachers were getting together to collaborate on lessons, curriculum development, and student needs. Teacher satisfaction, on the other hand, proved to be predictive of general willingness to innovate, which meant that happier, more satisfied teachers were indeed more open to implementing reforms, even when these reforms were associated with more workload. This relationship was implied in the literature, and clearly confirmed here. The ground breaking examination of teachers' psychological reactance to reform and general willingness to innovate indicated that general willingness to innovate is a possible buffer against reactance to reform, which means that teachers that were generally more open to change saw the SiA initiative as less threatening than the teachers that were generally less open to change. Finally, resonating with the literature, psychological reactance proved to be strongly associated with negative attitudes towards the SiA reform initiative, which means that teachers that perceived a freedom threat as a result of SiA were far more likely to hold a negative attitude towards SiA. Given the link between attitudes, intentions, and behavior, this result indicates the great cost of reactance, and the severity of its impact on the success of

reform efforts. Interestingly, teacher's implicit attitudes towards the reform played a mediating role in the relationship between general willingness to innovate and reactance to reform, and between reactance to reform and explicit attitudes towards SiA. This means that the implicit agreement with the principles behind a reform, on one hand, play a small part in the role as a buffer against reactance, and on the other hand also play a minor role in predicting negative attitudes via reactance.

This means that what a person actually thinks and feels about a reform's founding principles, its foundation, only plays a minor role in deterring or triggering reactance and negative attitudes, which speaks volumes about the power of reactance, and the importance of thoughtful, sensitive, and fair implementation of educational reforms, and clearly emphasizes the necessity of knowing the soil before unwittingly beginning to sow seeds.

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Abbreviations

At2SiA: Attitude towards “Schule im Aufbruch”

BMBF: Bundesministerium für Bildung und Forschung

CPTC: Collective pedagogical teaching community

ECLS-K: Early Childhood Longitudinal Program

EdCon: Veiled educational concepts from “Schule im Aufbruch”

Innov8: General willingness to innovate

ProCom: Professional community

React: Psychological reactance to “Schule im Aufbruch”

SES: Socioeconomic status

SEM: Structural Equation Modeling

SiA: Schule im Aufbruch (Schools in departure)

TCollab: Intensity of teacher collaboration

TSat: Teacher satisfaction

Appendices

Appendix A: Recruitment email 1

Sehr geehrter Herr Direktor!
Sehr geehrte Frau Direktorin!

Im Rahmen meiner Masterarbeit, die ich unter der Betreuung von Univ.Prof. Dr.Dr. Christiane Spiel schreibe, führe ich eine Studie zum Zusammenhang zwischen pädagogischer Kultur, Innovationsbereitschaft und Schulreform durch.

Ich bitte Sie herzlich, Ihren Lehrkörper auf den Fragebogen aufmerksam zu machen. Das Ausfüllen wird circa 10 Minuten in Anspruch nehmen. Falls eine ausreichend große Anzahl an Lehrpersonen Ihrer Schule teilnimmt, kann ich Ihnen gerne das Profil Ihres Lehrkörpers (aggregierte, anonyme Daten) schicken.

Falls Sie Interesse haben, dann schicken Sie mir bitte eine Antwortmail mit "ja" und der Anzahl der Lehrpersonen Ihrer Schule. Daraufhin bekommen Sie von mir einen Link für die Teilnahme an der Studie, den Sie über Ihren Verteiler weiterleiten können.

Mit freundlichen Grüßen

Peter Loetscher BSc

Appendix B: Email reply to positive responses

Sehr geehrte Frau Direktorin!
Sehr geehrter Herr Direktor!

Danke für Ihre Unterstützung!

Ich bitte Sie diese Nachricht an Ihre Lehrer/innen über Ihren Verteiler weiterzuleiten.

Mit bestem Dank!

Peter Loetscher BSc.

Sehr geehrte Lehrerin!
Sehr geehrter Lehrer!

Mein Name ist Peter Loetscher BSc. Unter der Betreuung von Univ.Prof. Dr.Dr. Christiane Spiel schreibe ich gerade meine Masterarbeit im Bereich Bildungspsychologie an der Universität Wien.

In meiner Masterarbeit geht es darum, wie Lehrpersonen mit neuen Herausforderungen wie Bildungsreformen umgehen. Dazu führe ich eine Fragebogenstudie durch, an der ich Sie herzlich bitte teilzunehmen (Dauer circa 10 Minuten).

Selbstverständlich sind Ihre Angaben anonym und nicht rückverfolgbar und persönliche Informationen wie Name und Geburtsdatum werden nicht miterfasst.

Falls Sie an der Studie teilnehmen wollen, klicken Sie bitte auf den folgenden Link: <http://www.soscisurvey.de/master1a> und geben danach das folgende Kennwort ein: **(Insert individual code here)**

Ich bedanke mich schon im Voraus sehr herzlich für Ihre Teilnahme!

Mit freundlichen Grüßen

Peter Loetscher BSc

Appendix C: Recruitment email 2

Sehr geehrte Frau Direktor!
Sehr geehrter Herr Direktor!

Ich habe Ihnen vor 10 Tagen geschrieben, dass ich gerade meine Masterarbeit im Bereich Bildungspsychologie an der Universität Wien schreibe und deswegen LehrerInnen für eine kurze Umfrage suche.

Falls Sie sich entscheiden diese Nachricht an Ihre LehrerInnen über Ihren Verteiler weiterzuleiten, wäre ich sehr dankbar!

Mit freundlichen Grüßen

Peter Loetscher BSc.

Sehr geehrte Lehrerin!
Sehr geehrter Lehrer!

Mein Name ist Peter Loetscher BSc. Unter der Betreuung von Univ.Prof. Dr.Dr. Christiane Spiel schreibe ich gerade meine Masterarbeit im Bereich Bildungspsychologie an der Universität Wien.

In meiner Masterarbeit geht es darum, wie Lehrpersonen mit neuen Herausforderungen wie Bildungsreformen umgehen. Dazu führe ich eine Fragebogenstudie durch, an der ich Sie herzlich bitte teilzunehmen (Dauer circa 10 Minuten).

Selbstverständlich sind Ihre Angaben anonym und nicht rückverfolgbar und persönliche Informationen wie Name und Geburtsdatum werden nicht miterfasst.

Falls Sie an der Studie teilnehmen wollen, klicken Sie bitte auf den folgenden Link: <http://www.soscisurvey.de/master1a> und geben danach das folgende Kennwort ein: **1X**

Ich bedanke mich schon im Voraus sehr herzlich für Ihre Teilnahme!

Mit freundlichen Grüßen

Peter Loetscher BSc

Appendix D: Survey items with descriptive statistics

<i>Part one: Teacher satisfaction (TSat)</i>	<i>n</i>	<i>mean</i>	<i>SD</i>	<i>Cron. α</i>
<i>Scale (0-4)</i>	248	3.30	.75	.705
1. Ich liebe es, Lehrer/in zu sein.		3.51	.83	
2. Ich bin mir sicher, dass ich im Leben der Kinder, die ich unterrichte, etwas bewirke.		3.38	.72	
3. Wenn ich die Entscheidung noch einmal treffen müsste, würde ich wieder Lehrer/in werden.		3.01	1.22	
<i>Part two: Professional community (ProCom)</i>	<i>n</i>	<i>mean</i>	<i>SD</i>	<i>Cron. α</i>
<i>Scale (0-4)</i>	248	2.93	.85	.866
4. In meiner Schule herrscht ein Gefühl der Zusammengehörigkeit und Lehrer/innen und Schüler/innen sind stolz auf ihre Schule.		2.84	1.13	
5. Die Schulleitung hat uns ein Schulleitbild vermittelt.		2.79	1.26	
6. Die Lehrer/innen meiner Schule stimmen dem Schulleitbild zu.		2.59	1.11	
7. Ich fühle mich in meiner Schule als Kollege/in akzeptiert und respektiert.		3.50	.81	
8. Die Lehrer/innen meiner Schule lernen ständig dazu und suchen nach Neuem.		2.90	.90	
<i>Part three: Teacher Collaboration (TCollab)</i>	<i>n</i>	<i>mean</i>	<i>SD</i>	<i>Cron. α</i>
<i>Scale (0-4)</i>	248	2.06	.70	.565
9. Wie oft treffen sich Kollegen/innen in Ihrer Schule, um Stunden gemeinsam zu planen?		2.49	1.00	
10. Wie oft treffen sich Kollegen/innen in Ihrer Schule, um Lehrpläne gemeinsam weiterzuentwickeln?		.86	.70	
11. Wie oft treffen sich Kollegen/innen, um über eine/n Schüler/in zu sprechen?		2.82	1.10	
<i>Part four: Willingness to innovate (Innov8)</i>	<i>n</i>	<i>mean</i>	<i>SD</i>	<i>Cron. α</i>

<i>Scale (0-3)</i>	248	1.91	0.53	.764
12. Ich möchte neue Inhalte in meine Arbeit integrieren, auch wenn dies mit mehr Arbeit verbunden ist.	2.30	0.67		
13. Obwohl es einen höheren Arbeitsaufwand bedeutet, möchte ich neue Methoden in meiner Unterrichtspraxis anwenden.	2.36	0.65		
14. Ich bin bereit, meine Arbeit als Lehrer/in ständig zu erneuern.	2.39	0.69		
15. Die Anwendung neuer Unterrichtskonzepte bedeutet eine Steigerung der Arbeitsbelastung, die ich nicht leisten kann. (-)	1.73	0.92		
16. Für die Unterstützung von innovativen Ideen und Konzepten brauche ich Entlastungen an anderen Stellen. (-)	0.76	0.76		
<i>Part five: Veiled SiA educational concepts (EdCon)</i>	<i>n</i>	<i>mean</i>	<i>SD</i>	<i>Cron. α</i>
<i>Scale (0-5)</i> (Veiled SiA educational concepts in parentheses)	248	4.13	0.53	.833
17. Die Schule sollte das eigenständige Lernen und Arbeiten der Schüler/innen fördern. (Self-Regulated Learning: SRL)	4.49	0.76		
18. In der Schule sollten die Schüler/innen selbst entscheiden können, wo sie das Fachwissen erwerben (z.B. Bibliothek, Schulhof, Aula, Klasserraum, usw.). (Open Learning Environment)	2.68	1.33		
19. In der Schule sollen die Lehrer/innen eher Coaches ihrer Schüler/innen sein und diese vor allem beim eigenen Lernen unterstützen. (Teachers as Coaches)	3.24	1.28		
20. Die Schule sollte die Überzeugung der Schüler/innen von ihren eigenen Fähigkeiten steigern. (Self-efficacy)	4.33	0.85		
21. Die Schule sollte die Fähigkeiten und Begabungen der Schüler/innen fördern, auch wenn diese außerhalb der normalen Schulfächer liegen. (Talent discovery and support)	3.58	1.25		

22. In der Schule sollte, Wertschätzung zum Alltag gehören. (Appreciation)	4.94	.27
23. In der Schule sollten Kinder lernen, Verantwortung zu übernehmen. (Taking responsibility)	4.80	.61
24. In der Schule sollten Kinder anderen Kulturen und Volksgruppen begegnen und lernen diese auch zu schätzen. (Cultural appreciation and coexistence)	4.46	.89
25. In der Schule sollen Kinder lernen, wie man lernt. (SRL and LLL)	4.73	.63
26. Lob und Anerkennung sollten zum Schulalltag gehören. (Praise and recognition)	4.87	.89
27. In der Schule sollten Schüler/innen selbst entscheiden können, wann sie vorgegebene Lernaufgaben in verschiedenen Fächern abarbeiten. (Free-learning environment)	2.62	.63
28. In der Schule sollten Kinder lernen, gemeinsam als Team Konflikte zu lösen. (Overcoming challenges with teamwork)	4.53	.47

<i>Part 6: Reactance to "SiA" (React)</i>	<i>n</i>	<i>mean</i>	<i>SD</i>	<i>Cron. α</i>
<i>Scale (0-6)</i>	248	3.02	1.25	.871
29. Durch meine Erfahrungen mit "Schule im Aufbruch" fühlte bzw. fühle ich mich in meiner persönlichen Entscheidungsfreiheit eingeschränkt, meine Arbeit selbst zu bestimmen.		2.92	1.52	
30. Durch meine Erfahrungen mit "Schule im Aufbruch" konnte bzw. kann ich mich frei entscheiden, in der Arbeit das zu machen, was ich möchte. (-)		3.11	1.42	
31. Durch meine Erfahrungen mit "Schule im Aufbruch" fühlte bzw. fühle ich mich sehr unter Druck gesetzt.		2.99	1.70	
32. Durch meine Erfahrungen mit "Schule im Aufbruch" hatte bzw. habe ich genügend		3.16	1.43	

Wahlmöglichkeiten, das zu machen, worauf ich Lust hatte bzw. habe. (-)

33. Durch meine Erfahrungen mit "Schule im Aufbruch" sah bzw. sehe ich mich in meiner Freiheit, das zu unterrichten, was ich möchte, eingeschränkt. 2.90 1.70

<i>Part 7: Attitude towards "S.i.A." (At2SiA)</i>	<i>n</i>	<i>mean</i>	<i>SD</i>	<i>Cron.α</i>
<i>Scale (0-5)</i>	248	2.99	1.10	.964

34. schlecht-gut	2.92	1.20
35. dumm-klug	3.12	1.01
36. nachteilig-vorteilhaft	2.97	1.15
37. negativ-positiv	3.03	1.24
38. unerwünscht-wünschenswert	2.93	1.34
39. unnötig-notwendig	2.80	1.35
40. schädlich-förderlich	3.16	1.13

Part 8: Demographics

<i>41. Geschlecht:</i>	<i>n</i>	<i>%</i>
Gesamtstichprobe	248	100
weiblich	189	76.2
männlich	57	23.0
missing	2	.8

<i>42. Alter</i>	<i>n</i>	<i>mean</i>	<i>SD</i>	<i>%</i>
Gesamtstichprobe	248	47.9	11.0	100
missing	3			1.2

<i>43. Ausbildung:</i>	<i>n</i>	<i>%</i>
Gesamtstichprobe	248	100
missing	2	.8

Pädagogische Hochschule / Akademie	214	86.3
Universität	7	2.8
Abschlüsse von Beiden Institutionsformen	25	10.1

<i>44. Geprüfte Fächern:</i>	<i>n</i>	<i>%</i>
Gesamtstichprobe	248	100
missing	7	2.8
Mathematik	98	39.5
Deutsch	80	32.3

Englisch	70	28.2
Physik	29	11.7
Chemie	27	10.9
Biologie	38	15.3
Geschichte	40	16.1
Geographie	36	14.5
Bildnerische Erziehung	27	10.9
Musikerziehung	27	10.9
Ernährung und Haushalt	12	4.8
Bewegung und Sport	59	23.8
Tech./Textiles Werken	26	10.5
Informatik	43	17.3
Sonstige Fremdsprachen	6	2.4
Religion	35	14.1

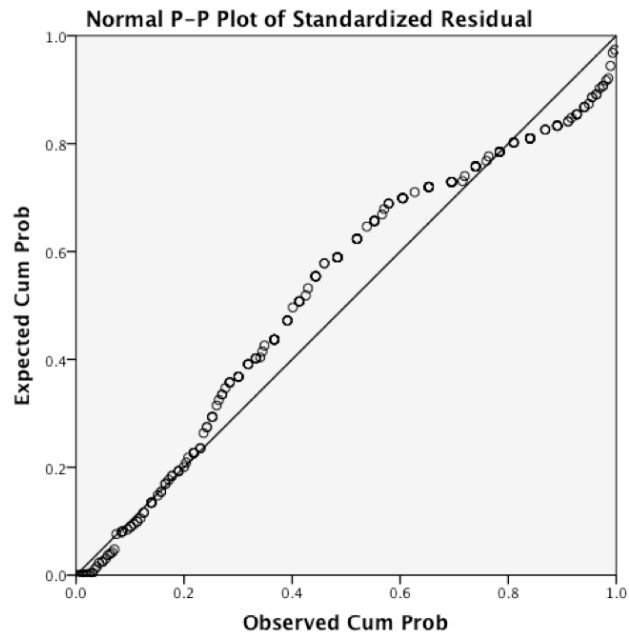
<i>45. Dienstjahren:</i>	<i>n</i>	<i>mean</i>	<i>SD</i>	<i>%</i>
Gesamtstichprobe	248	24.3	12.9	100
missing	9			3.7

<i>46. Ausmaß der Lehrverpflichtung:</i>	<i>n</i>	<i>%</i>
Gesamtstichprobe	248	100
missing	7	2.8

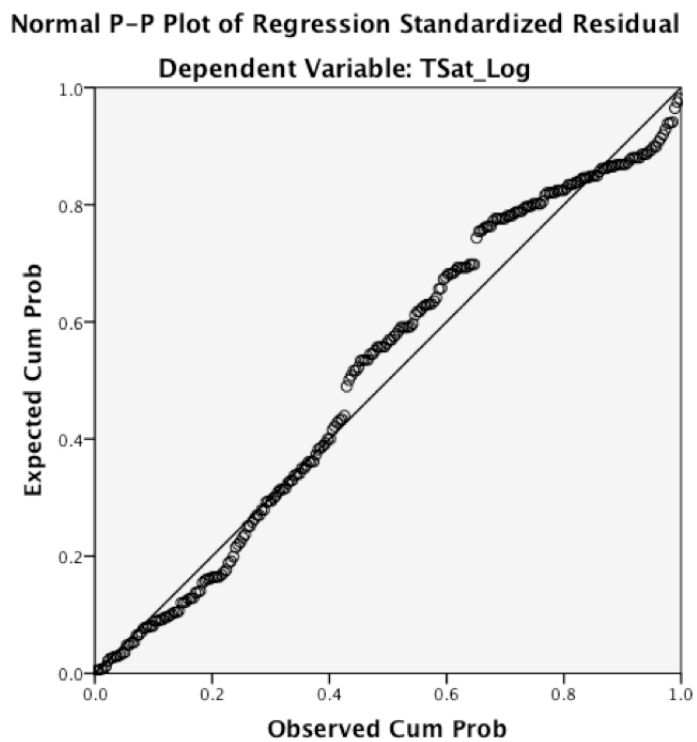
weniger als eine volle Lehrverpflichtung	50	20.2
volle Lehrverpflichtung	121	48.8
mehr als eine volle Lehrverpflichtung	70	28.2

Appendix E: Log-transformation of teacher satisfaction

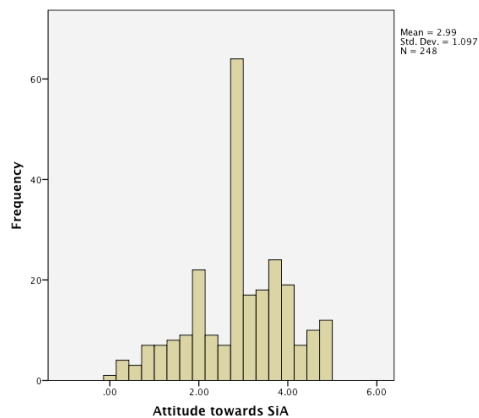
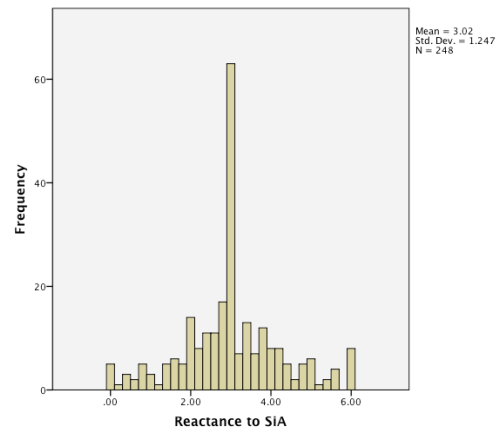
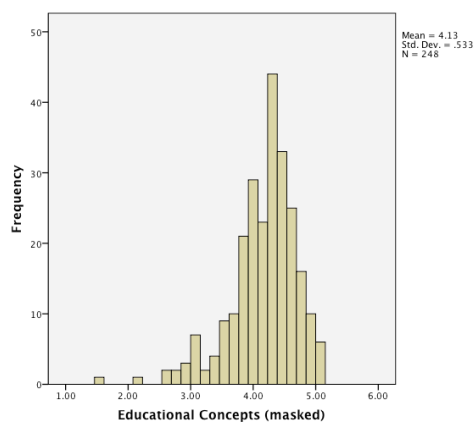
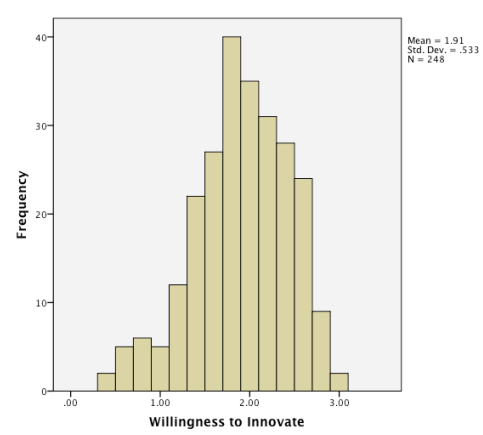
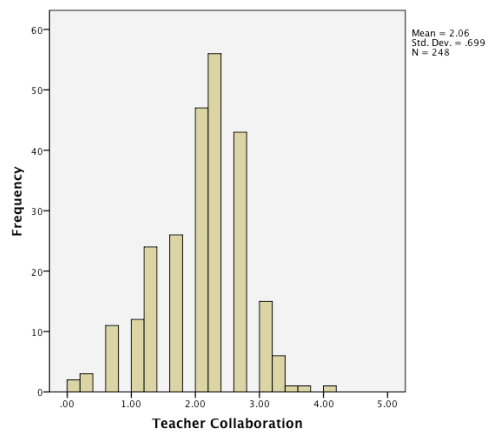
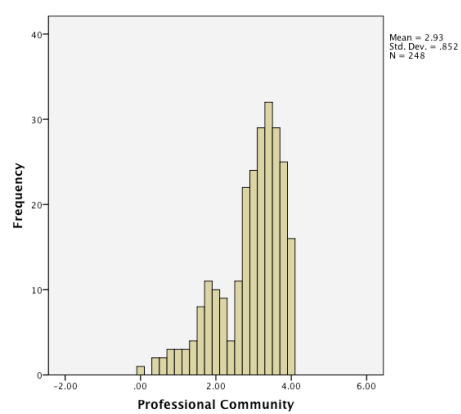
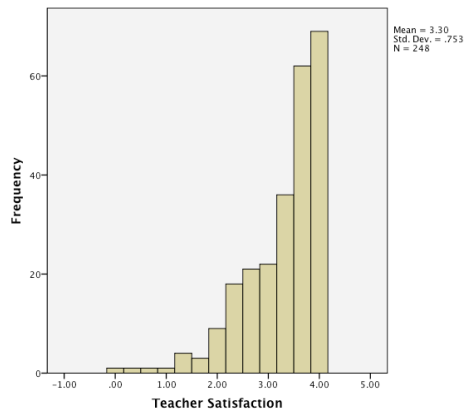
1) Teacher satisfaction: Normal P-P plot prior to log transformation



2) Teacher satisfaction: Normal P-P plot after log transformation

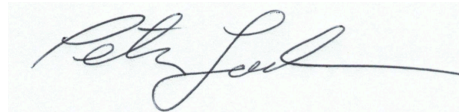


Appendix F: Scale Response Frequency charts



Declaration of academic honesty

I hereby confirm that the current thesis in all of its relevant parts was conducted independently.

A handwritten signature in black ink, appearing to read 'Peter Loetscher', written on a light green rectangular background.

Vienna, Austria
June 2017

Peter Loetscher

Tables, Figures, and Images

Table 1: Gender and Age in the Sample and Population

Table 2: Correlation Matrix and Descriptive Statistics for all Scales

Table 3: Hierarchical Model for Predictors of Teacher Satisfaction

Table 4: Teacher Satisfaction predicting Willingness to Innovate

Table 5: Willingness to Innovate as a Predictor of Reactance

Table 6: Reactance as a Predictor of Attitudes towards SiA

Figure 1: Mediated Relationship between willingness to innovate and reactance to SiA

Figure 2: Veiled Educational Concepts mediating the Relationship between Reactance to SiA and Attitudes towards SiA

Figure 3: Model suggestion for possible Structural Equation Modeling

Image 1: Plant growth CCO

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