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Improving Parent/Guardian Awareness of Kindergarten Entry Health Requirements

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by

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Abstract

Ensuring students meet health requirements to enter Kindergarten is a time-consuming process. By improving education to parents to help them discern differences between PreK and Kindergarten requirements, the health of students can be optimized and the time burden for administrators and school nurses can be reduced. There is evidence that parents/guardians better respond to non-written material delivered through push notification or email. A 5-minute video presentation was distributed to 24 parents/guardians of PreK students. Project impact was measured through a pre/post survey evaluating levels of confidence in child readiness for Kindergarten. Results identified that parent/guardian confidence was increased after education. Further research is required regarding sample size and population setting. Education delivered in a non-written format may improve parent/guardian knowledge of Kindergarten health entry requirements.

Keywords: parent, guardian, immunization, Kindergarten, push notification, education

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Problem Recognition

Childhood vaccines are essential for reducing the spread of preventable diseases. All 50 states require vaccinations in order to commence schooling, whether entry occurs at the Kindergarten, pre-Kindergarten (PreK), or post-Kindergarten level (National Conference of State Legislatures, 2022). These requirements are based on the Centers for Disease Control and Prevention (CDC) guidelines for vaccine administration.

Children frequently commence the school year without being up to date on vaccine requirements. This variation is allowed for under North Carolina law, with 30 days of grace being provided (North Carolina Public Health Law, 1983). Any student who has not received the required vaccines, or who does not have an appropriate exemption, after 30 days from school starting, is required to be excluded from school.

While parents/guardians receive information on required vaccines prior to the school year starting, many do not meet the requirement within the 30-day period. The pressure to avoid exclusion requires a compressed timeframe for parents/guardians to book appointments. Mecklenburg County has, in years past, organized mass vaccination clinics to ensure exclusion is minimized for students.

Ensuring that parents/guardians understand requirements is important. Many may believe they have met requirements when enrolling their child for PreK, not realizing that entrance to PreK may be granted depending on the age of entry but that Kindergarten entry may require a further set of vaccinations.

A review of the literature shows that parent/guardian reminders assist in improving immunization adherence (Machado et al., 2021; Hofstetter et al., 2015; Harvey et al., 2015). Methods of communication include postal reminders, phone calls, text

messages, in-person education, and online contact through electronic medical records. In-person education was considered optimal, but also resource-intensive. All methods had varied results with both reminder (vaccines due) and recall (vaccines late) notifications being used to improve parent/guardian contact.

Reminders are sent with the assumption that parents/guardians have been unable to access health services. This may be due to lack of prioritization, lack of transport, lack of provider, or lack of knowledge, as opposed to parent/guardians who are actively choosing not to vaccinate. North Carolina allows for two exemptions to childhood vaccinations for school. The first is a medical exemption, requiring assessment by the patient's health provider, with a recommendation forwarded to the State Medical Director of Health. This process is limited to a small number of qualifying conditions or instances and may take some time to be confirmed. The second is a religious exemption requiring a parent/guardian to state in writing that they wish to be exempt due to religious beliefs. This process does not require confirmation of membership in a church or accompanying verification from a religious leader.

Problem Statement

Ensuring immunization compliance is a significant part of the school nurse workload in the early part of the school year, across Mecklenburg County, North Carolina, and the United States. Parents/guardians may be unaware of or confused about, their child's status until being informed, and booking an appointment may be difficult to achieve during the 30-day time period. Children requiring further vaccines may be inadequately protected, and risk exclusion from school until requirements are met.

Summary of Literature Review

An English language search of PubMed, CINAHL, ProQuest database, and JAMA was conducted using the keywords “immunization”, “childhood”, “parent” “reminders” and “education”. The time period between 2012 and 2022 was included, and the terms “COVID-19” “teenage”, “HPV”, “human papillomavirus” and “cervical cancer” were excluded. A total of 30 articles met the initial criteria for inclusion. Nine articles were examined, including systematic reviews, DNP publications, quantitative research, and system reports.

Renosa et al. (2021) reviewed the literature to capture information around ‘nudging’. The phrase ‘nudging’ encompasses reminders, recalls, reframing of information, incentives, and changing the messenger. Forty-eight articles including 28 randomized controlled trials, met the criteria for inclusion. Promising approaches include incentives, trusted messengers, and ensuring that information is delivered in an understandable format. Limitations were the timespan restricted to 2008 and later when the term ‘nudging’ emerged, the exclusion of ‘immunization’ versus ‘vaccination’ which may have unnecessarily excluded some papers, and the higher income settings of many of the studies.

Machado et al. (2021) conducted a systematic review of interventions to increase vaccine coverage in low socioeconomic status communities in developed countries. A total of 40 studies addressed the importance of access, outreach, reminders, education, and incentives, along with a focus on up-to-date contact information. Ensuring language was targeted appropriately for the level of parent/guardian health literacy was considered essential. Limitations included a USA-centric focus that caused a skewing in data due to

variations across different states. The review also only covered the previous 10 years. Finally, the definition of 'low socioeconomic status' was often inconsistent across studies.

A randomized controlled trial by Hofstetter et al. (2015) enrolled 2,054 children in a study to improve measles, mumps, and rubella (MMR) vaccination rates. Parents/guardians with cell phone access were randomly assigned into one of three groups: A group receiving three reminders to book an appointment as well as a reminder before their appointment, a group receiving a reminder that they had an appointment, and a group with no reminder. The group receiving multiple reminders demonstrated increased rates of appointment and MMR vaccination rates around 5 points higher than other groups. Limitations included the parents/guardians excluded prior to the study (around 300 parents/guardians without cell phone access) and around 15.6% of the study population (320 children) who did not ever schedule an appointment.

A systematic review and meta-analysis by Harvey et al. (2015) examined parent/guardian interventions to improve early childhood (0-5 years) vaccine uptake. These interventions included postal reminders, telephone reminders, combined recall-and reminder, education, education and reminder, and education from community volunteers. All these interventions were effective to some degree, with postal and telephone reminders showing an average of 10.6% and 4% respectively. Education about immunization increased uptake by 8.3%, however, written education was found not to be effective. A limitation of the review was unexplained heterogeneity amongst all interventions except telephone reminders. This suggests differences in methods or services provided that may have accounted for results. There were too few studies to fully

explore this effect. A further concern was the relevance of some interventions, with the ubiquity of cell phones exerting a presence and convenience that postal interventions may not be able to compete with.

Bielecki et al. (2020) distributed Polish language pamphlets to Polish students at three schools in Scotland, to try to increase uptake of the influenza vaccine. Six other schools were used as a control. The overall effect was a 5% increase in the number of influenza vaccinations gained, however, this was matched by a refusal rate of 8.3%. The positive effect was significantly higher than in control schools where increases of only 0.5% were noted. The previous refusal had been passive (no consent form returned) whereas refusals were now actively returned. Limitations include the possibility that parents/guardians in control schools had read the pamphlet online. The number of schools (nine) was considered a possible limitation due to sample size and a possible cluster of bias, with a suggestion of expanding the study to confirm wider effects.

Atkinson et al. (2019) performed a systematic review and meta-analysis of 13 randomized controlled trials examining the effect of ‘push’ notifications. ‘Push’ notifications are initiated by the source and include text messages, in-app notifications, and email. They do not require the recipient to search for information or take action to find the notification. There was increased odds of 1.18 of vaccine uptake for those using push notifications compared to non-digital interventions. Limitations included considerable heterogeneity that could not be explained. Most studies were conducted in the USA with more than half taking place in the New York City area.

Kempe et al. (2014) conducted a randomized pragmatic trial of 18,235 children in 15 Colorado counties with the goal of any new immunization within 6 months of a

notification from a centralized database. The Colorado Immunization Information System (CIIS) was used to send up to four reminders or recalls by mail or auto-dialer with medical practices having the option of endorsing the notification and adding their name to the message. The messaging was most effective when dispatched centrally, but with practice endorsement with an effect of 9.2% vs 9.8%; $p<0.001$. It was also more cost-effective than a practice-based system, with central calling costing $11.75 per new immunization versus $74.00 for practice-based calling.

Two simultaneous randomized trials by Szilagyi et al. (2020) compared interventions in New York and Colorado with a total of 61,931 children in New York and 23,845 children in Colorado. Auto-dialer, text, and mail interventions were compared against control arms. The autodialer intervention provided a 1.4 percentage point gain in New York ($p=.007$) and a 3.0 percentage point gain in Colorado ($p=.001$). The mail intervention had no statistically significant gain in New York but a 1.6 percentage point gain in Colorado ($p=.01$). Text messaging provided no significant gain in New York, and was not used in Colorado.

Cushon et al. (2012) conducted an intervention in Saskatchewan to examine the effects of repeat phone calls with a final letter on immunization rates. The study included 24,540 children aged 14 months to 2 years and showed significant improvement in vaccination rates over the 2-year study period from 66.4% to 75.7% overall. Cushon et al. (2012) acknowledge other possible reasons for the increase, including generally raised awareness of vaccine programs, and acknowledge the limitations of attribution without a control group. Lack of contact information is a limiting factor as well as poor access to

the Saskatchewan Immunization Management System for First Nations health organizations.

Needs Assessment

Target Population

The target population was parents/guardians of rising Kindergarten children in Mecklenburg County, North Carolina. These children may have completed PreK or will be entering the school system for the first time. Entrance requirements for vaccinations may differ for PreK and Kindergarten depending on the age that the child enters PreK.

PICOT Statement

- (P) For parents/guardians of rising Kindergarten students
- (I) how to do targeted reminders
- (C) compared to no reminders
- (O) improve parent/guardian confidence in their child's vaccination admission criteria
- (T) after an educational intervention session?

Sponsors and Stakeholders

The Centers for Disease Control and Prevention (CDC) schedule is set to optimize the immunological effect. Deviation from this schedule increases the potential for the spread of disease in an under-vaccinated population. Society benefits from the reduction of preventable communicable diseases.

Children and Families

Children bear the brunt of vaccine schedule deviation in that they may be susceptible to disease until the schedule is adhered to and, in North Carolina, are

excluded from school if they cannot demonstrate compliance with the schedule. As stakeholders, this group has low power and high interest. While their direct involvement is likely to be low, they will see the benefit from earlier appointments, reduced stress of last-minute vaccinations, and reduced school exclusion.

School Health Nurses

In North Carolina, compliance with the CDC schedule is required to attend school. School Health Nurses are tasked with monitoring deviations from the schedule. The early part of the school year involves obtaining and evaluating immunization records, informing parents/guardians, and ensuring appointments have been made in a timely manner to meet the State-mandated deadline. This work is time-consuming and can vary from small numbers of children without full compliance, to dozens of children requiring multiple doses to achieve compliance. This group is high power but the low interest as their direct involvement in the project is limited.

Medical Offices

Vaccine appointments to prevent exclusion increase pressure on medical clinics in a compressed timeframe. These appointments may prevent other children from gaining optimal care in a timely manner. This group is high power and high interest, depending on their direct involvement with the project.

Public Health Department

The number of children requiring vaccinations to prevent exclusion from school is significant enough to require mass clinics. These clinics require multiple staff, working extra hours, and the allocation of public resources. Some of this cost is defrayed by health insurance claims, but the cost of uninsured patients is borne by the Public Health budget.

Organizational Assessment

Strengths

- Administration staff, teachers, and parents/guardians are all vested in ensuring their children meet requirements.
- Pre-existing communication frameworks exist for contacting parents/guardians and requesting their participation.

Weakness

- Parents/guardians are likely to be busy and involved with personal lives.
- Responses from parents/guardians are not always immediate for non-urgent issues.

Opportunities

- Improving current reminder notices may change the current process for communicating.
- Early notification allows parents/guardians to plan, reducing bottlenecks.

Threats

- Parents/guardians may not respond in a timely manner.
- Parents/guardians may decline to participate.

Available Resources

The required resources are minimal, with the intervention requiring involving a targeted reminder through a push notification from a communication application. All parents/guardians have cellphone access and use the communication application.

Desired and Expected Outcomes

Parents/guardians will demonstrate increased confidence in their knowledge of the requirements for entering Kindergarten. While parents/guardians cannot be expected to know the exact details of the immunization schedule, they should be aware of how to access their child's vaccination status. The number of Kindergarten students requiring reminders and exclusion will decrease.

Team Selection

The team will consist of the DNP student, the DNP project faculty chair, and the Academy Manager at Ballencrest Academy. The project chair holds a Doctor of Nursing degree and will serve as a committee member. The manager is a registered teacher and holds a Bachelor of Arts in Elementary Education and Teaching.

Cost-Benefit Analysis

There are two facets of cost-benefit analysis to improve parent/guardian education regarding vaccines. The immediate benefit of the intervention is a reduction in follow-up workload, either by the patient's clinic or by the school nurse. Students vaccinated according to the schedule do not require follow-up.

The primary goal of disease reduction in both the individual and the population is also achieved. Increased adherence to the vaccination schedule reduces the likelihood of a disease outbreak. Increased adherence results in less student exclusion.

There are 96 public elementary schools in Charlotte, with average Kindergarten rolls around 100 or more students (Charlotte Mecklenburg Schools, 2021). Student adherence to the schedule on entry to school is varied and often requires significant input

to remedy. The follow-up process for a child who has not met vaccine requirements for Kindergarten entry is at least 1 hour, involving phone calls and letters.

The intervention assessed parent/guardian confidence in whether their child meets health requirements for Kindergarten entry through a survey and gauged their intention to access services in the coming months. Education was then provided about entry requirements. Parent/guardian confidence was measured after this education, as well as the intention to make an appointment with their health provider. The total time burden of 15 minutes encompassed a pre-survey (5 minutes), an educational intervention reminder (5 minutes), and a post-survey (5 minutes). A total of 24 parents/guardians of 13 PreK students were provided with the survey and reminder. The pre-survey consisted of five questions and an open comment box.

1. I am confident that my child has met immunization requirements for entering Kindergarten this upcoming school year.
2. I am aware that the immunization requirements for entering PreK are different from the immunization requirements for entering Kindergarten.
3. I am aware that exemptions to immunization requirements exist in North Carolina.
4. My child has received a Well Child Check in the past year OR I have scheduled a Well Child Check for my child in the next 3 months.
5. I plan to schedule a Well Child Check with my child's healthcare provider in the next 3 months.

The post-survey consisted of five similar questions and a comment box

1. I am confident that my child has met immunization requirements for entering Kindergarten this upcoming school year.
2. I am aware that the immunization requirements for entering PreK are different from the immunization requirements for entering Kindergarten.
3. My child is exempt from immunization requirements.
4. I believe my child may have received vaccines early, or with a shortened period.
5. I plan to schedule a Well Child Check with my child's healthcare provider in the next 3 months.

The questions were reviewed by the Project Leader and Project Chair and face validity was established.

Project Costs

Table 1

Project Costs

	Cost/hour ($)	Units	Total ($)
Administration time	25.00	2	50.00
Total			50.00

Scope of Project

This project aimed to measure and improve parent/guardian confidence in their child's vaccination status prior to Kindergarten entry. The project was concerned with ensuring parents/guardians understand the differences between PreK and Kindergarten entrance requirements. The education was intended to emphasize the importance of

proactive appointments to prevent inconvenient appointment times under threat of exclusion.

The project did not intend to educate parents/guardians on the specific vaccine components or reasons for vaccine timings. The project did not intend to address general principles of vaccine education, vaccine hesitancy, or alternative schedules. The project was not concerned with COVID-19, Influenza, or Hepatitis A vaccination administration.

Barriers to the project included a potential lack of organizational support and a potential lack of parent/guardian engagement with the project.

Goals, Objectives, and Mission Statement

Goals of Project

- **Goal 1:** Parent/guardian knowledge of Kindergarten requirements will be assessed.
    - **Outcome objective 1:** Participation requests will be sent to 24 participants. The project has a goal of 75% participation.
    - **Process objective 1:** Participants will comprise parents/guardians of rising Kindergarten students who have attended PreK in 2021-2022. Recruitment will take place through the childcare center.
- **Goal 2:** All participants will complete the project requirements.
    - **Outcome objective 2:** All participants will receive clear communication to ensure that they can complete the project requirements
    - **Process objective 2:** Participants will receive all content to ensure they can access the surveys and education efficiently.

- **Goal 3:** Participants will demonstrate improved knowledge of entrance requirements.
    - **Outcome objective 3:** Participants will indicate improved confidence in their knowledge of their child's vaccination status and demonstrate plans to contact health services in the immediate future.
    - **Process objective 3:** Participants will complete the project within 3 weeks of receiving the project request.

Mission Statement

This project aimed to ensure that parents/guardians understand the vaccination requirements for Kindergarten entrance. Targeted reminders were aimed to optimize the contact between parents/guardians and health services and improve vaccination schedule adherence. Proactive contact by parents/guardians increases immunization rates and reduces the workload of school staff and nurses.

Theoretical Underpinnings

This project used the principles of Andragogy as a guide for imparting education to parents/guardians in the form of a reminder. Andragogy was developed by Malcolm Knowles in the 1980s and refines the principles of adult learning theory into five key assumptions; the self-concept of the learner, prior experience, readiness to learn, orientation to learning, and motivation to learn (Knowles et al., 2005). By utilizing these principles, it was anticipated that education would be received more favorably by parents/guardians involved in the project and improve their learning experience, as demonstrated by Uskun et al. (2008) and Traicoff et al. (2021).

The main issue is correcting misconceptions that parents/guardians may have while supporting their role as parents/guardians. The information must be concise, relevant, and presented in an understandable format. Information need not be newly provided that any repetition of familiar ideas is presented appropriately.

Self-Concept of the Learner

Adult learners are self-directed and take responsibility for their own learning. In the context of the parent/guardian, they must be supported to ensure that new information is received in an optimal format. Ensuring information is presented in an appropriate format ensures the parent/guardian's self-concept remains intact.

Prior Experience

Adult learners bring their prior experiences to their learning. Parents/guardians have been through the process of vaccination with their children in order to enter PreK; the information is not new but builds on their current knowledge. Ensuring that parents/guardians are aware that new requirements build upon previous requirements allows them to recognize their own prior experience.

Readiness to Learn

Adult learners must be ready to learn. Reminders for entry requirements are presented in the context of preparing for the new school year. This ensures that parents/guardians are ready to receive new information.

Orientation to Learning

Orientation to learning assumes that the focus of learning will be on a current problem or issue. Adult learners must understand what they are learning and why. The pre-survey presents questions that will prime parent/guardian attention prior to learning.

This concept is closely linked to readiness to learn; parents/guardians are motivated because the issue is important and timely.

Motivation to Learn

The primary assumption about adult learner motivation is that it is intrinsic; learner behavior is driven by internal desires to improve and develop. This same principle applies to parent/guardian motivation when learning; they are driven by a desire to ensure their child is meeting requirements for school. The education will target this desire to receive concise and relevant information.

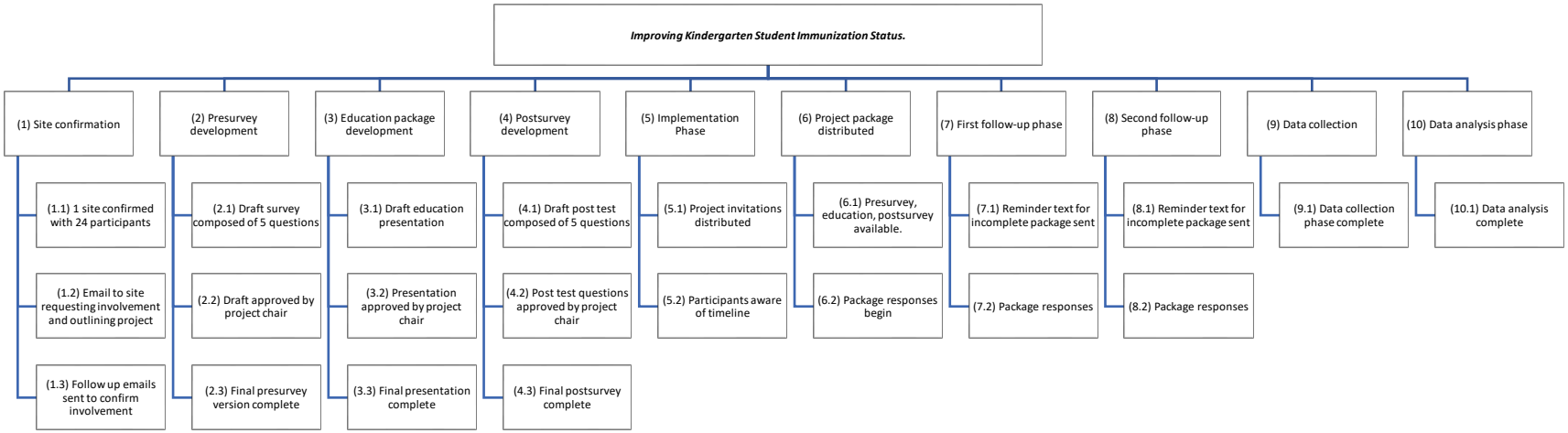
Work Planning

The project delivered a reminder to parents/guardians of rising Kindergarten students about upcoming vaccine requirements. The project was delivered online and encompassed a pre-survey, an education intervention, and a post-survey which were delivered simultaneously. Participants accessed the material online through a push notification sent through the application the childcare center uses for communication. The project time period was anticipated to be 30 days or at the completion of all surveys, whichever occurred first. The total time burden for each participant was expected to be a maximum of 15 minutes.

Work Breakdown Structure

Figure 1

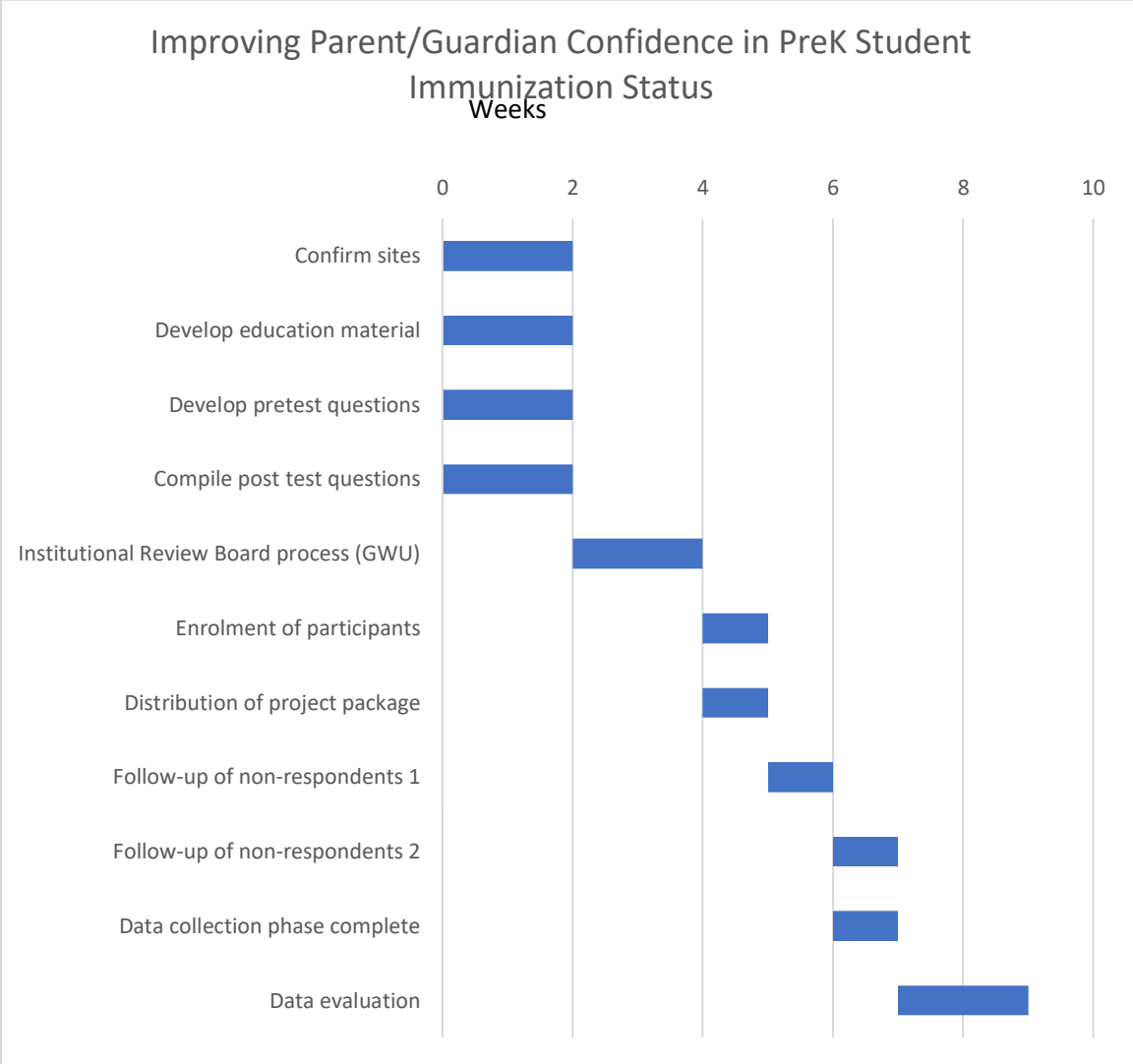
Work Breakdown Structure



Timeline

Figure 2

Timeline of Project GANTT Chart



Budget

Table 2

Project Budget

		Quantity	Unit cost ($)	Budget ($)	Actual ($)
Initial site liaison	Academy Manager	1	25	25	25
Package distribution	Academy Manager	0.5	25	12.5	12.5
Participant Follow-up	Academy Manager	0.5	25	12.5	12.5
Total				50	50

Evaluation Planning

This project involved assessing parent/guardian confidence in their child's immunization status before and after a reminder intervention. The reminder delivered briefly clarified immunization requirements for entering Kindergarten. The reminder was expected to stimulate parent/guardian intention to schedule appointments with their health provider prior to the start of the new school year and ensure vaccinations are up-to-date.

PDSA Model

As a quality improvement project, the PDSA cycle (The W. Edwards Deming Institute, 2021) offers a suitable methodology for designing a successful project. It involves a 'Plan' phase (including data collection), a 'Do' phase where a potential solution is tested, a 'Study' phase where solution efficacy is assessed, and an 'Act' phase where the plan and solution can be adjusted. The cyclical nature of the model allows for this adjustment.

Plan

The PDSA model will assist in assessing whether reminders can improve parent/guardian confidence in their child's vaccination status. It is hypothesized that the pre-test will show varying levels of confidence among parents/guardians, with a correspondingly low number of scheduled medical appointments. It is further hypothesized that the post-test will show increased levels of parent/guardian confidence in their child's immunization status or a corresponding increase in the intention to schedule an appointment in the following 3 months.

The primary participants are the parents/guardians and the DNP project student. The project is supported by the DNP project faculty chair and the Academy Director at Ballencrest Academy. Project delivery will be the responsibility of the DNP project student, with distribution and collection assistance from the Academy Director.

A possible inflection point is that the pre-test fails to identify any lack of confidence; that all parents/guardians believe that their child meets requirements. However, this confidence may also decrease after the reminder is given. This data would require a change; either in the education package or reconsidering the problem. The cyclical nature of the PDSA model allows for this adjustment.

Do

The project package link was delivered by the DNP Project student to the manager to be distributed to parents/guardians.

Study

Data were analyzed for percentage change. The key metric was any change in survey scores after the reminder intervention. The expected outcome was an increase in

confidence in immunization status as well as an increase in intention to schedule a medical appointment in the following 3 months.

Act

Implementation of changes to school practices was outside the scope of this project. However, if the project indicates a knowledge deficit that is likely to be replicable at other sites, and the education improves this deficit, then further dissemination may be appropriate. If the expected outcome is not achieved then the topic will be reassessed as to the nature of the failure and revised prior to potential implementation at future sites.

Timeframe

The consent form, pre-survey, reminder, and post-survey were distributed simultaneously to all parents/guardians, with a request that parents/guardians do not read the reminder before completing the survey. The proposed timeframe was 3 weeks, allowing for 1 week for parents/guardians to commence the survey, 2 weeks to follow up with uncompleted surveys, with data collection closing at the end of Week 3

Resources

Participants were sent a link via push notification in the school communication app. The manager confirmed that all participants have access to a cell phone or computer, and use the application regularly.

Data

The goal of the project was to assess improved knowledge through a reminder. Important data points included baseline knowledge and post-intervention knowledge. No demographic data was required from parents/guardians or students.

Implementation

Threats and Barriers

Possible threats to project success included the failure of a team member, technology, or participants. If the Academy Director had been unable to complete communications, due to illness, or absence, then the project would have experienced disruption. Disruption prior to project commencement would have prevented communication of the project link to participants. This would have created delays while an alternative staff member was added, or abandonment of the project site. This would have required a new site selection, team member selection, and Institutional Review Board process. Disruption during the project would likely have prevented optimal data collection, with an increase in responses in Week 2, after the first reminder message.

Possible technology failures include a failure of the communication platform or a failure of the project components. A communication failure would mean participants did not see the original message. This possibility was mitigated through duplication of the original message in the weekly reminder messages. A total of three messages were sent to all possible participants.

Failure of the Qualtrics platform, either through a corrupted link, or server error would also cause the project to fail. The link distributed to the Academy Director was checked from multiple devices to ensure a correct connection. Responses in the first 2 days were an indicator that at least some participants were able to access the project. It cannot be guaranteed that participants would make contact if they could not access the project.

Another third technology issue is the failure of the material within the project, namely the audiovisual presentation. While this was embedded with the Qualtrics platform, a risk that this may malfunction would likely jeopardize project completion. Some participants might communicate the issue to the Academy Director or Project Lead, while others may choose to exit the process and not return.

Preliminary discussions with the Academy Director identified that all parents/guardians had access to both email and push notifications, and were regularly engaged with content distributed by the academy. This reduced the likelihood of internet access being a barrier to participation. A further concern was that participants may decline to engage with the project due to views on vaccines and immunization. All information was presented based on current evidence and referencing North Carolina law. It is unknown how many participants declined to engage, due to the content, after reading the invitation message.

It is possible barriers not identified also existed, but the Project leader was unaware of any barriers to the project that occurred during implementation. There was twice-weekly communication with the Academy Director, either verbally or via email to ascertain any concerns that may have been passed on informally.

Monitoring of Implementation

The project was launched, as planned, on Day 1, transmitted by the Academy Director through the communication platform, and project participation was monitored on the Qualtrics platform. A daily assessment was conducted to establish any increase in participant numbers and any comments inputted in the comment field. Reminders were communicated at the end of Week 1 and Week 2, with the project closed after 3 weeks.

Project Closure

Successes

The project was delivered without any technological issues. There were 11 participants in total, from a total of 24 parents/guardians, representing 13 students. Of the 11 participants, eight completed both surveys. There was an initial response with the first invitation, an increase in responses after the second invitation, and no further increase after the third invitation. This suggested that the project was able to be delivered and accessed by those who participated. There was no feedback to the Project Lead, Project Chair, or Academy Director, either formally or informally.

Shortcomings

The primary shortcoming was the small, homogenous sample size. Anecdotal discussions with the Academy Director noted that parent/guardian participants were likely to be above-median-income earners, English-speaking, and responsive to communications from the Academy. This is likely not representative of the Mecklenburg County community. A further issue was the lack of detail regarding exact vaccine timings in the education video. Increasing the level of detail may have been useful for some parents/guardians but may have reduced participant interest as the length of the video increased.

Important Project Data

Key issues were awareness of differences between PreK and Kindergarten entry requirements, confidence that their child would meet entry requirements, awareness of possible exemptions, contact with a primary care provider, and intention to contact a primary care provider in the next 3 months. Data were collected on all these issues.

Significant Project Changes

The most significant negative impact on this project was the change from the original intent to conduct the intervention in public Title 1 schools, to implementation in a small privately-owned daycare. Utilization of the public school system would likely have produced data more applicable to a cross-section of students in the County, specifically parent/guardian education level, access to a primary care provider, and language capability. However, Charlotte-Mecklenburg Schools had placed a moratorium on all parent/guardian surveys during the year in which the project was commenced related to the COVID-19 pandemic, thus prohibiting the use of this population. Preliminary discussions with PreK sites within the CMS system yielded approximately 150 potential participants, with enthusiastic support, but these sites were unable to advance. Numerous requests were placed to a private daycare and PreK centers to encourage participation, with minimal response.

Conversely, changing to a small daycare allowed for seamless communication, with participants who spoke English, and who were known to respond promptly to communications. Due to these factors, only one communication platform was needed and only one delivery method (online) was required. This reduced the workload of project delivery, especially in regard to the translation and distribution of the project.

Issues that Need Further Exploration

Providing additional information on vaccine timing may have allowed parents/guardians to examine their child's records and advocate for themselves if the timing was found to be incorrect. While most participants answered with confidence that their child was correctly vaccinated, correlating this confidence with health records may

have provided value. All parents/guardians declined to use either religious or medical exemptions. Larger sample size would have likely shown more representative values with the County population.

Budget Variances

There were no costs involved with the delivery of the project.

Interpretation of Data

Two participants viewed the first survey and chose not to continue. One participant answered the first survey but chose not to answer the second survey. It is unknown if any of these three participants viewed the video. Eight participants completed both surveys representing a 33% response rate. Participants who completed both surveys are included in the data analysis in order to compare the potential effectiveness of the intervention.

Of the eight respondents to *"I am confident my child has met immunization requirements for entering Kindergarten this year*", two showed a change in their answer between the first and second survey from 'agree' to 'strongly agree'. This represents a 40% increase in confidence from "agree" to "strongly agree" after viewing the intervention video. None of the participants indicated decreased confidence after viewing the intervention video during data analysis. (Table 3)

Table 3

Comparison of Confidence Child Met Immunization Requirements for Entering Kindergarten

Confidence	Frequency 1	Frequency 2	Percentage Change
Strongly disagree	0	0	0%

Confidence	Frequency 1	Frequency 2	Percentage Change
Disagree	0	0	0%
Agree	3	1	-67%
Strongly Agree	5	7	+40%
Prefer Not to Answer	0	0	0%

To the question *'I am aware that the immunization requirements for entering PreK are different from the immunization requirements for entering Kindergarten",* two of the three respondents indicated in the first survey that they were unaware that entry requirements to PreK were different from Kindergarten. In the second survey, these two participants indicated they were now aware of the difference resulting in 100% of participants being aware of the difference in immunization requirements between PreK and Kindergarten. This represents a 33% increase in awareness after viewing the intervention video. None of the participants indicated decreased awareness after viewing the intervention video during data analysis. (Table 4)

Table 4

Comparison of Awareness of Immunization Requirements PreK and Kindergarten

Response	Frequency 1	Frequency 2	Percentage Change
Yes	6	8	+33%
No	2	0	-100%
Prefer Not to Answer	0	0	0%

Only one respondent was previously unaware of possible vaccine exemptions (Table 5). All eight participants indicated that their child would be fully vaccinated and did not intend to use either medical or religious exemption (Table 6). The rate of religious exemption in Mecklenburg County was 1.9% in 2017-18, with a medical exemption rate of 0.2% (North Carolina Department of Health and Human Services, 2018). There was no negative feedback regarding questions or the information presented, despite content regarding vaccines often arousing controversy.

Table 5

Comparison of Awareness of North Carolina Immunization Exemptions

Response	Frequency 1	Frequency 2	Percentage Change
Yes	6	8	+33%
No	1	0	-100%
Prefer Not to Answer	1	0	-100%

Table 6

Immunization Exemption Status

Response	Frequency	Percentage
Yes, religious exemption	0	0%
Yes, medical exemption	0	0%
No, fully immunized	8	100%
Prefer not to answer	0	0%
Don’t know	0	0%

All participants answered that their child had received a well-child check (WCC) in the past year (Table 7). This is likely not representative of the wider county.

Table 7

Response for Well-Child Check (WCC)

Response	Frequency	Percentage
WCC in past year	9	100
WCC next 3 months	0	0
Prefer not to answer	0	0

Participants were asked on the first survey to indicate plans to schedule a well-child check with their child's healthcare provider in the next 3 months, and this was compared in the second survey. Participants did not change their plans to seek a primary care appointment after viewing the video; those without a planned visit did not adjust their plans and those who did plan a visit also indicated they would maintain their plan (Table 8).

Table 8

Comparison of Plans to Schedule a Well Child Check in the Next 3 Months

Response	Frequency 1	Frequency 2
Yes	3	3
No	5	5
Prefer not to answer	0	0

A question asking respondents about vaccines administered early or with incorrect dosing gap was only answered by one person, who answered 'prefer not to answer',

despite the availability of a 'don't know' option. This lack of answers suggests the education delivery lacked context for respondents to answer with confidence. Ascertaining vaccine timing and dosing gaps requires a detailed examination of individual vaccination records; the intention of the education video was not to provide this level of detail.

The project showed that non-written communication with parents/guardians could increase knowledge levels. This increase varied depending upon the topic, and the existing level of knowledge. The data are not robust enough to draw significant conclusions but serve as a positive indication to recommend future projects in the larger arena. A small number of participants noted increased confidence in their child's immunization status. Importantly, from a Public Health perspective, participants were aware of possible exemptions but had chosen to vaccinate their children.

It is tentatively suggested that video education could improve parent/guardian knowledge. The impact was measured through Likert score questions, with any change indicating an improvement in knowledge. This is based on two of three respondents describing increased confidence in their child meeting health requirements to start Kindergarten, and two of two respondents showing increased knowledge that entry requirements were different between PreK and Kindergarten. The impact of this project was limited both by the sample size and the population. This population contained a high percentage of vaccinated children who received a well-child check within the past year, thus there is limited area for significant improvement.

Charlotte-Mecklenburg Schools/Mecklenburg County currently informs parents/guardians via letter if there is a deficit in their child's vaccination record. This

letter details which doses are missing from the record. A video presentation intervention would complement the child-specific information delivered in the letter. The video would assist parents/guardians in understanding why a particular missing dose is required while also stimulating the decision to obtain a primary care appointment before the new school year commenced. Providing further detailed information might also allow parents/guardians to analyze their child's records to establish possible issues with timing and advocate with their health provider.

In order to sustain this project, the video could be provided to elementary school parents/guardians through a variety of sources: push notifications, emails, and live or virtual Kindergarten orientation sessions. Translation into other languages would ensure maximal reach. At a minimum, the video would need to be available in Spanish.

Changes to the survey could focus on reasons for not planning a well-child check. This could include requesting the date of the last primary care visit and the planned date of the next visit. Barriers to access could also be surveyed. Many families do not have a regular primary care provider due to financial, transportation, or language barriers and this disrupts consistent vaccination care. Surveying intention to seek care, as well as perceived barriers, may assist to reduce delays in vaccination.

While participant confidence may have increased, parents/guardians were already confident that their child met requirements, answering 'agree' or 'strongly agree'. A larger sample from a different population may yield participants who declared themselves less confident. The effect of the project on such a group remains to be seen. A possible supplementary question might request an open answer as to why they were confident. An in-depth project could examine and discuss vaccination records with parents/guardians.

All participants answered ‘don’t know’ or ‘prefer not to answer’ when asked if they thought their child may have received vaccines with an incorrect time gap. This may be due to the information presented in the video, which did not describe gaps in detail. The gaps and timing of each vaccine are complex, and outside the scope of a brief intervention.

Conclusion

Non-adherence to the childhood immunization schedule is a risk to public health and creates a significant burden for school staff at the beginning of the school year. Currently, written reminders are the standard for communicating non-adherence. These frequently require repetition to be effective. Creative delivery of content, using accessible communication platforms is shown to be effective in achieving increased adherence to schedules. By improving communication platforms and modifying the content delivery, schools may be able to reduce compressed workloads and improve adherence before state-mandated deadlines.

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