

Successes and Challenges in Using Group-Level Incentives to Increase Children's Aggregate Fruit and Vegetable Consumption for Lunch in One Wisconsin Elementary School

Sydney Chinchanchokchai, PhD; Eric M. Jamelske, PhD

ABSTRACT

Purpose/Objectives

Existing research has investigated the effects of using individual incentives and positive reinforcements to influence children to eat more fruits and vegetables for lunch and snack during school. This study explored using group-level incentives to motivate children in a Wisconsin elementary school to eat more fruits and vegetables.

Methods

This research examined the influence of a variety of group-level incentives on aggregate fruit and vegetable consumption by children from pre-K through fifth grade during school lunch over three periods of study in one Wisconsin elementary school (N=424). Baseline consumption was measured over an initial period (3 days) followed by an incentive period (4 days) and a return to baseline period (3 days). Students were offered three different types of incentives to motivate them to eat more fruits and vegetables during the incentive period. They were informed of the benefits of eating more fruits and vegetables as well as what rewards they could earn for increasing their consumption through both school-wide morning announcements and pre-lunch classroom announcements during the incentive period.

Results

Results showed that group-level incentives increased aggregate fruit and vegetable consumption in children during the incentive period. Increased consumption was sustained during the return to baseline period, but only for fruit. Children's vegetable intake dropped after the incentive period.

Applications to Child Nutrition Professionals

These findings contribute to the development and implementation of best practices that can be used by schools to increase children's fruit and vegetable intake. They also indicate challenges that may be encountered when implementing a group-level incentive program. The ultimate goal of this research is to improve both the eating habits and the health and wellness of children.

INTRODUCTION

American children eat fewer fruits and vegetables than the United States Department of Agriculture (USDA) recommended guidelines suggest they should (National Cancer Institute, 2014; Eaton et al., 2012; Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009; Lorson, Melgar-Quinonez, & Taylor, 2009). Given that children spend significant time in school and are exposed to a variety of foods during this time, there have been many school-based policies and interventions designed to increase children's fruit and vegetable consumption. Intervention designs with significantly different components including verbal encouragement, linking

curriculum to food service, and teacher and family involvement have all shown positive effects on consumption (Perry et al., 2004; Reynolds et al., 2000; Gortmaker et al., 1999). The USDA Fresh Fruit and Vegetable Program has also been shown to have positive effects on children's consumption of fruits and vegetables for school snack (Bartlett, Olsho, & Klerman, 2013; Bica & Jamelske, 2012; Jamelske & Bica, 2012; Ohri-Vachaspati, Turner, & Chaloupka, 2012; Coyle et al., 2009; Jamelske, Bica, McCarty, & Meinen, 2008). These results are also supported by the findings of comprehensive reviews of a wide range of school-based interventions to increase children's fruit and vegetable intake (Evans, Christian, Cleghorn, Greenwood, & Cade, 2012).

Additionally, recent federal regulations require children to take at least one half-cup serving of fruits or vegetables as part of the National School Lunch Program. Although there is limited research on this new requirement, research has shown positive effects from providing children with a choice of a variety of fruits and vegetables (Smith, Just, & Wansink, 2010; Slusser, Cumberland, Browdy, Lange, & Neumann, 2007; Adams, Pelletier, Zive, & Sallis, 2005). In addition, several research studies have explored the effect of using incentives and positive reinforcement including praise, social recognition, prizes, and money to influence children to eat more fruits and vegetables for lunch and snack during school. One group of researchers has shown that monetary rewards can increase children's fruit and vegetable consumption for school lunch (Just & Price, 2013). Similarly, Hendy, Williams, and Camise (2005) found issuing tokens redeemable for small prizes increased children's fruit and vegetable consumption that lasted throughout the reinforcement conditions. Tangible incentives have also been used in combination with other school interventions such as the Food Dudes (FD) program, which showed videos of FD heroes battling against the evil Junk Punks. This program has been shown to positively impact children's fruit and vegetable intake in both the U.S. and the U.K. (Wengreen, Madden, Aguilar, Smits, & Jones, 2013; Horne, Lowe, Hardman, Jackson, & Woolner, 2004). Lastly, Bica, Jamelske and Lagorio (2015) have shown that incentives can influence children to bring fruits and vegetables from home to eat during school snack times, and that teacher involvement and enthusiasm are an important factor in the magnitude of this effect.

While prior research has explored how incentives affect children's fruit and vegetable consumption, most studies measured the effect at the individual level (an individual reward to each student for individual behavior) (Just & Price, 2013; Wengreen et al., 2013; Horne et al., 2004). The purpose of this study was to extend the literature on using incentives to increase fruit and vegetable consumption in children by implementing group-level incentives to motivate children to eat more fruits and vegetables at the school level. These efforts were in partnership with administrators, teachers, and food service staff at one Wisconsin elementary school. Using group-level incentives and aggregate consumption allowed researchers to use exact weight measures of fruit and vegetable intake and include all children eating school lunch in the study. This method also allowed reporting on how children responded to incentives as a group at the school level.

METHODOLOGY

Study Setting

The researchers obtained permission from the school administrators to use the student population. All students enrolled in the school in grades pre-K through fifth who bought school lunch were included in the study. The appropriate University Institutional Review Board approved all research materials and procedures used in this study.

Materials

Using a digital scale, researchers recorded weights for each fruit and vegetable item including the total amount available for serving, amount leftover at the end of lunch, amount of waste, and amount consumed on each observation day. Bus tubs were used to collect the fruit and vegetable waste from children's lunch trays for each individual item. Incentives offered to children included twelve \$20 Walmart gift cards (two for each grade) and 500 free passes redeemable for two free games at a local bowling alley (one for every child, teacher, and food service staff). The final incentive was a plaque recognizing the achievement of increasing aggregate fruit and vegetable consumption.

Procedure

Lunchroom Process. Lunch consisted of three 20-minute periods, each serving two grades. Children who took the school lunch would pick up the main entrée and proceed to the self-serve salad bar to select the fruits and vegetables they wanted. This school required each child to take at least two sides of fruits/vegetables from the items offered. The children would then check out and sit down to eat. As each lunch period ended, children were directed by teachers to go to the disposal area to leave their trays and exit the lunchroom.

Study Periods and Incentives Process. The initial baseline period was designed to establish the aggregate level of fruit and vegetable consumption before any incentives were offered. This period included three days of observation: Monday, Wednesday, and Friday (MWF). The incentive period followed directly and was scheduled to include six days of observation also on MWF over two weeks. The incentive period actually only included four days of observation for reasons beyond the researchers' control. Two days were eliminated due to school events where grandparents and parents came to school to share lunch with the students. Because lunch was not served/eaten normally on these two days, the observation could not be conducted.

During the incentive period, the incentives were introduced to the students in two ways. First, the principal read a daily school-wide announcement over the public address system alerting students that they were part of a research project challenging them to eat more fruits and vegetables during school lunch. The announcement also informed students they could win prizes if the school-level fruit and vegetable intake increased above what they normally ate. This announcement ended with the principal encouraging students to improve their health and win some prizes by eating more fruits and vegetables.

Secondly, each teacher read a more detailed announcement about the research and incentives to their students before lunch each day. This announcement repeated the challenge of eating more fruits and vegetables and also told students what prizes they could earn if fruit and vegetable intake increased above normal levels. Specifically, they were informed that all children and staff in the school would receive free bowling passes and that two children from each grade would be randomly selected to receive a \$20 Walmart gift card. This announcement also ended with the teacher encouraging students to eat more fruits and vegetables to improve their health and win these prizes. The principal and all teachers were asked to be as enthusiastic as possible in reading these assignments on ten days over two weeks even though observation took place on only four days.

The study concluded with a return to baseline period consisting of three days of observation on MWF. There were no announcements during this period other than the awarding of the prizes

that students had earned from increasing their fruit and vegetable consumption as a group compared to the initial baseline period.

School Lunch Menu

The study was designed to keep the fruit and vegetable items offered on observation days the same across the three periods of study. Two fruits and two vegetables were offered each day. Table 1 summarizes the fruits and vegetables served during each period of study.

Table 1. Fruits and Vegetables Served During Each Study Period (baseline, incentive, return to baseline and total)

Fruit	No. of times served	Vegetables	No. of times served
Apple slices (M)	1, 2, 1 = 4	Green salad (M W F)	3, 4, 3 = 10
Peaches (M)	1, 2, 1 = 4	Baby carrots (M W)	3, 4, 2 = 9
Red grapes (W)	1, 2, 1 = 4	Cherry tomatoes (F)	0, 0, 1 = 1
Pears (W)	1, 2, 1 = 4		
Fruit cocktail (F)	1, 0, 1 = 2		
Kiwi (F)	1, 0, 1 = 2		
Total	6, 8, 6 = 20	Total	6, 8, 6 = 20

Data Collection

On every observation day, researchers weighed/recorded the total amount of each fruit and vegetable available for serving. As each group of children exited the lunchroom, they left their trays on tables. Researchers then sorted the leftover fruit and vegetable waste separately for each item and recorded the amount of waste. After all lunch periods concluded, researchers weighed/recorded the amount of each fruit and vegetable that children did not take from the salad bar. Food service staff provided the total number of lunches served on each observation day. The amount of fruits and vegetables consumed was calculated by subtracting the leftover weight and the waste weight from the initial weight for each fruit and vegetable item. Amounts were then computed in ounces and divided by the number of lunches served to obtain our measure of interest for each fruit and vegetable item in terms of ounces per lunch served. A short voluntary survey was conducted after the last study period to assess the participation of the principal and teachers.

RESULTS AND DISCUSSION

Study participants included 424 students and 20 teachers across pre-K through fifth grade at one Wisconsin elementary school (Table 2). Students were predominantly white (85.4%) and approximately evenly divided by gender.

Consumption results were analyzed using Analysis of Variance (ANOVA) and independent t-tests comparing aggregate fruit and vegetable intake during the three periods. Figure 1 provides a visual illustration of the changes in fruit and vegetable consumption over the study periods. The average daily number of lunches served during the initial baseline period was 277.3 ($SD = 2.1$)

compared to 269.5 ($SD = 3.3$) and 261.0 ($SD = 34.4$) in the incentive period and return to baseline period, respectively.

Fruit and Vegetable Consumption

The one-way ANOVA showed no significant difference among the three periods in fruit and vegetable consumption [$F(2,7) = 1.58, p > 0.1$]. However, the post hoc analysis using an independent t-test indicated that children consumed more fruits and vegetables when incentives were offered [$M_{\text{Baseline}} = 2.32 (SD = 0.40), M_{\text{Incentive}} = 3.40 (SD = 0.70), t(5) = 2.38, p = 0.06$]. Additionally, the consumption of fruits and vegetables did not decrease significantly in the return to baseline period [$M_{\text{Incentive}} = 3.40 (SD = 0.70), M_{\text{Return}} = 2.94 (SD = 1.16), t(5) = 0.67, p > 0.1$].

Fruit Consumption

To further examine differences in consumption, separate analyses were conducted for fruits and vegetables. The one-way ANOVA showed no significant difference among the three periods in fruit consumption [$F(2,7) = 1.09, p > 0.1$]. Moreover, post hoc analysis revealed that the heightened fruit consumption during the incentive period was not statistically different from the baseline [$M_{\text{Baseline}} = 1.80 (SD = 0.50), M_{\text{Incentive}} = 2.62 (SD = 0.60), t(5) = 1.92, p > 0.1$]. There was also no significant difference between the incentive period and the return-to-baseline period in children's fruit consumption [$M_{\text{Incentive}} = 2.62 (SD = 0.60), M_{\text{Return}} = 2.53 (SD = 1.15), t(5) = 0.13, p > 0.1$].

Vegetable Consumption

In terms of vegetable consumption, ANOVA results showed significant differences among the three measured periods [$F(2,7) = 5.91, p < 0.05$]. Additionally, the post hoc analysis showed a significant increase in the amount of vegetables consumed compared to the baseline period [$M_{\text{Baseline}} = 0.52 (SD = 0.18), M_{\text{Incentive}} = 0.78 (SD = 0.13), t(5) = 2.29, p = 0.07$]. The amount of vegetable intake also dropped significantly in the return to baseline period [$M_{\text{Incentive}} = 0.78 (SD = 0.13), M_{\text{Return}} = 0.39 (SD = 0.15), t(5) = 3.57, p < 0.05$].

Findings suggest that introducing group-level incentives (\$20 Walmart gift cards, free bowling passes, and recognition plaque) increased and sustained combined fruit and vegetable intake at the school-level. In particular, this combination of incentives resulted in a stronger statistically significant rise in vegetable consumption, whereas the increase in fruit intake was relatively large in magnitude, but not quite statistically significant. Although children's vegetable intake dropped after the incentive period, combined fruit and vegetable consumption did not decline significantly in the return to baseline period. Just and Price (2013) found that an individual monetary incentive helped sustain combined fruit and vegetable consumption in children for two weeks after the incentive program, but the effect disappeared after four weeks. Thus, results from this study add to this evidence showing that one week later vegetable intake dropped more than fruit intake, but children sustained combined fruit and vegetable intake one week after the incentive program. This suggests children are more likely to be influenced to eat fruit compared to vegetables, possibly because fruits are higher in sugar content and energy density (Kirby, Baranowski, Reynolds, Taylor, & Binkley, 1995; Gibson & Wardle, 2003), whereas vegetables are generally less preferred by children (Baxter & Thompson, 2002; Hendy et al., 2005). Nonetheless, the current findings are in line with previous research suggesting that withdrawing rewards did not immediately lower combined fruit and vegetable intake.

Table 2. Student Participant Demographic Information (N=424)

Class	%	Gender	%
Pre-kindergarten	5.1	Male	51.7
Kindergarten	16.3	Female	48.3
First grade	15.8	Race/Ethnicity	%
Second grade	15.8	White	85.4
Third grade	13.7	Asian American	6.8
Fourth grade	17.5	African American	0.7
Fifth grade	15.8	Others	7.1

Note: Across the total school enrollment of 424 students , 47.2% qualified for free/reduced price school meals.

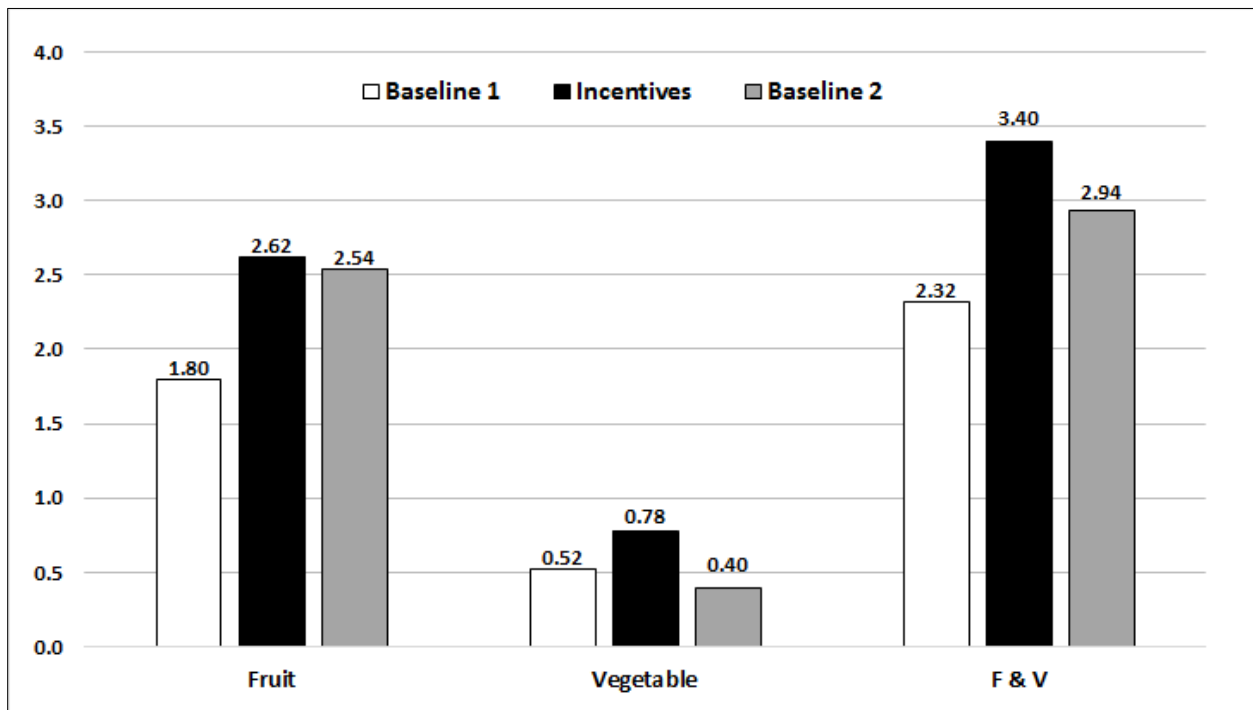


Figure 1. Average Fruit and Vegetable Consumption in Ounces per Lunch Served

Additional Interpretations

Figure 1 highlights the magnitude and practical significance of these results. First, average baseline fruit consumption per lunch served increased from 1.80 to 2.62 ounces. Although this difference was not statistically significant, it is large in percentage terms (45.6%), suggesting that children did eat more fruit during the incentive period. Second, the average baseline vegetable consumption per lunch served increased from 0.52 to 0.78 ounces which is also large in percentage terms (50.0%). Together, these results show consumption increased by 1.08 ounces per lunch served representing a rise in combined fruit and vegetable consumption of nearly 50%. Moreover, despite a drop in average vegetable consumption to 0.40 ounces per lunch served during the return to baseline period, fruit intake remained statistically unchanged compared to the incentive period. Therefore, group-level incentives appear to have driven up both vegetable

and fruit consumption for this group of elementary school children. These results also suggest the increased fruit consumption was sustained in the return to baseline period, but the rise in vegetable consumption was not.

To visualize these results in terms of food portions, average fruit and vegetable consumption was compared between the initial baseline and incentive periods translating the measure of ounces per lunch served into half-cup servings per lunch served. This calculation is a weighted average incorporating the half-cup weights for each different item served in each study period. The half-cup weights for fruit range from four ounces for diced peaches and diced pears to two ounces for sliced apples, while the half-cup weights for vegetables ranged from three ounces for cherry tomatoes to one-eighth of an ounce for green salad. Table 3 shows that combined average fruit and vegetable intake increased nearly 50% from 0.89 to 1.30 servings per lunch served.

Table 3. Average Half-cup Servings of Fruits and Vegetables Consumed per Lunch Served

Phase	Fruit	Vegetable	Fruit + Vegetable
Baseline	0.58	0.31	0.89
Incentives	0.88	0.42	1.30
Change	0.30	0.11	0.41
%Change	51.7%	35.5%	46.1%

Principal and Teacher Participation

A short voluntary survey was conducted asking both the principal and the teachers about their level of engagement and enthusiasm in reading the announcements and encouraging students to eat more fruits and vegetables during the incentive period. The principal promptly completed the survey reporting that the announcement was read over the public address system nine out of ten mornings during the incentive period and rated the reading of the announcement as enthusiastic/encouraging.

In contrast, only seven out of 20 teachers (35%) returned completed questionnaires with five teachers reporting that they read the announcement to the students in the classroom before lunch three to four days or less out of ten days during the incentive period. Moreover, four of the teachers rated their reading of the announcement as somewhat enthusiastic/encouraging while the rest said they were enthusiastic/encouraging. Teachers were also asked to provide their students with additional encouragement and motivation to eat more fruits and vegetables beyond just reading the announcement, but just one teacher reported doing so on nine to ten days and another said they did so on five to six days. The other five teachers provided additional encouragement to their students on only three to four days (2) and two days or less (3) respectively. Moreover, only one teacher rated their additional encouragement as meaningful, while four said it was somewhat meaningful and two said it was not very meaningful.

Together, these self-reported results suggest the principal was a willing and enthusiastic participant in the study, but collectively the teachers were significantly less engaged and enthusiastic in encouraging their students to consume more fruits and vegetables. This is especially true given that the teachers who completed the questionnaire were likely more actively engaged compared to those who did not take the time to answer the survey. The lack of teacher

participation was a critical challenge to the success of the study because previous research has found that teachers are one of the key success factors in attempts to increase children's fruits and vegetable intake at school (Auld, Romaniello, Hiemendinger, Hambridge, & Hambridge, 1998, 1999).

CONCLUSIONS AND APPLICATION

Incentives have been used by researchers as positive reinforcement to influence fruit and vegetable consumption for lunch and snacks at school (Just & Price, 2013; Wengreen et al., 2013). This study adds to the existing literature by examining the effects of group-level incentives on children's aggregate fruit and vegetable intake for lunch at one Wisconsin elementary school. The findings suggest that group-level incentives increased and sustained combined fruit and vegetable intake at the school-level. Results from this study confirm findings from prior research that incentives can increase children's fruit and vegetable intake at school.

Study Strengths and Limitations

This research study has several strengths. Group-level incentives were used to measure the influence on aggregate school-level fruit and vegetable consumption, while other work has investigated incentives and consumption at the individual level. This procedure allowed an exact weight measure of consumption in ounces per lunch served across all children eating the school lunch with very little interference to normal school lunch procedures. Moreover, offering all students free bowling passes and a chance to win a \$20 gift card if group-level behavior changed was relatively easy to implement compared to observing each child and then rewarding positive behavior with individual prizes. Additionally, the prizes were provided by local businesses who would like to assist schools in improving child nutrition at a reduced cost. These factors could be important for schools with limited resources. Moreover, creating group-level behavior change could be possibly desirable because it may lead to a change in culture through peer effects. Lastly, these findings add to the existing evidence suggesting a need to find effective ways to increase children's vegetable consumption.

This research study also has several limitations. The aggregate measure of fruit and vegetable consumption prevents identification of differential impacts specific to race/ethnicity, gender, age, or socio-economic status. Similarly, this design cannot discern if consumption increased more/less for children with initially low/high fruit and vegetable intake. Another limitation of this study is the degree to which students (especially younger students) were able to understand the announcements made by the principal and teachers informing them of the incentives and encouraging them to eat more fruits and vegetables. Lastly, this study included twelve scheduled days of observation across three periods of study, but only ten days of useable data were obtained. All else equal, the results would have more statistical power and, thus, the findings would have greater meaning with additional observation days.

Challenges Encountered

There were several challenges in conducting this research specific to planning and scheduling. The arranged schedule included six observation days during the incentive period, but was later reduced due to two special days (Grandparents Day and Parents Day) where lunch would not be served as normal. Therefore, consumption could not be measured on these days and, thus, the incentive period has only four days of data. Additionally, most fruits and vegetables served were

consistent during the study, but there were instances where the items served were not what was planned. Green salad was scheduled for all three days each week (M W F), while carrots (M W) and cherry tomatoes (F) were scheduled two days and one day respectively. However, on Friday during the initial baseline, carrots were served a third day meaning our baseline did not include children's consumption of cherry tomatoes. Similarly, cherry tomato intake was not observed during the incentive period due to the two special lunch days, mentioned above, which also resulted in no kiwi or fruit cocktail data during this period.

Another factor that could not be controlled was food quality, which could affect the amount of fruits and vegetables children select/eat (Péneau, Hoehn, Roth, Escher, & Nuessli, 2006). There was only one instance that could impact the study when the kiwi served during the return to baseline period was unripe and hard to the touch. One final factor to consider is that other food items served may affect fruit and vegetable intake. For example, if the entrée/dessert was one of the children's favorites, they may be less likely to eat fruits and vegetables and vice versa. However, this study did not control for the lunch menus regarding entrées/desserts which may have affected the results.

Despite the limitations and challenges, the findings show group-level incentives increased children's aggregate consumption of fruits and vegetables for lunch in this elementary school setting. This increase was more pronounced for vegetables in the short run; however, the increase for fruit intake was sustained one week after incentives were removed while vegetable intake returned to baseline levels. This evidence along with findings from other research suggests that future programs should focus on finding effective and sustainable methods of increasing children's vegetable consumption.

Additionally, working with schools and, in particular, food service staff requires a great deal of advance planning, and the unexpected can happen. Thus, future research should control for as many issues as possible and include flexibility to deal with issues as they arise. Future research should also include as many observation days as possible and include a control school to increase the power and meaning of results. Most importantly, successful programs to increase children's fruit and vegetable intake in schools will require substantial teacher and administrator involvement. In particular, past research cites several barriers that prevent greater teacher involvement in projects such as this including a lack of time, training, and materials as well as administrative support (Connell, Turner, & Mason, 1985). Therefore, researchers, schools, community organizations, and policymakers should cooperate to support and empower teachers to engage more actively in programs to improve children's eating behavior which will require additional time and resources.

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BIOGRAPHY

Chinchanachokchai and Jamelske are Assistant Professor and Professor, respectively, at the University of Wisconsin-Eau Claire located in Eau Claire, Wisconsin.