

Young Worker Safety

Incident Reporting Among Working Minors in New Jersey

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Among many of the potential out-of-school activities that are available to older children, paid employment and volunteering are two common legal options. According to the most recent Bureau of Labor Statistics data, the estimated number of 16- and 17-year-olds in the workforce in 2006 was 2.4 million, or 32.5% within that age group (Rauscher & Myers, 2008).

Minors (younger than age 18) generally work during summer, the academic year after school and/or weekends. In New Jersey, however, through school-sponsored programs, minors and other students up to age 21, such as special-needs students, may participate in

paid and unpaid structured learning experiences (SLEs) during and/or after school as part of their educational program (students receive grades and/or school credit).

More than 200,000 adolescents in the U.S. suffer work-related injuries every year, and working teenagers have been consistently shown to be more likely to suffer an occupational injury compared to adults. Thus, it is necessary to investigate potential associations between adolescent working conditions and adverse health outcomes to inform policies, programs, interventions and daily occupational safety and health professional practice, including jobsite process, engineering and administrative controls.

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IN BRIEF

- Through school-sponsored career and technical education programs in New Jersey, students may work during and/or after school hours, and work part-time in paid, unpaid and volunteer positions called structured learning experiences.
- Schools must submit information on reportable incidents. This is the only youth-worker-focused, school-based, state-mandated injury surveillance system in the U.S.
- This article summarizes strengths, limitations and challenges of the current reporting form and presents select analyses to illustrate the system's utility to identify potential disparities.
- The data presented, in the context of existing federal and state child labor, wage and hour laws, and current public health concerns about adolescents, support future enhancements to surveillance and to training offered by SH&E professionals for teachers and employers who supervise student work experiences.

Factors previously investigated concerning occupational injuries among minors include lack of experience, developmental issues, stress (e.g., family, friends, relationships, school, sports, work), and lack of safety and health knowledge. Frone (1998) studied general psychosocial and behavioral influences and hypothesized that teenagers may be more rebellious, impulsive or careless. These attributes could lead to an increased chance of injury. Furthermore, Frone states that depression may adversely affect an individual's ability to process information, thereby interfering with the ability to function and work sufficiently.

However, these factors were not found to be associated with reported work injuries among studied minors; substance abuse during work was positively correlated with work injury. Another factor not investigated by Frone (1998), but discussed by Steinberg (2007) is how adolescence (ages 15 to 24) is a developmental window of vulnerability given the time between puberty and maturation of the cognitive-control system; both vary between individuals.

Federal and state laws protect young workers in various indoor and outdoor environments with respect to environmental and occupational exposures. Under the Fair Labor Standards Act of 1938, reportable violations include missing working permits, hazardous occupations order violations and improper working hours (e.g., past age-specific nighttime limits, total hours worked per day or week). For schools, federal and state laws cover indoor and outdoor microenvironments on school grounds as well as external microenvironments off school grounds, including transportation (as either the driver or the passenger). Laws affect minors working as part of school curricula for experience; New Jersey (NJ) laws adopt federal laws by reference or are more stringent (NJDOE, 2006; NJLWD, 2009a).

An overall goal of public health surveillance regarding occupational injury and illness among minors and students, including those with special needs, is to use available data to inform and develop policies, programs and interventions to help prevent or reduce exposures leading to adverse acute and chronic health outcomes. Published peer-reviewed research data on injury, illness and disability among students, including minors and young adults (e.g., age 18 to 21), and the underlying tracking systems available, have been limited.

Within the U.S., 13 states were represented in published studies on injury and illness and/or child labor law violations, namely regarding work permits or working papers (Banco, Lapidus & Braddock, 1992; Belville, Pollack, Godbold, et al., 1993; Brooks, Davis & Gallagher, 1993; Cooper & Rothstein, 1995; Delp, Runyan, Brown, et al., 2002; Dunn, Runyan, Cohen, et al., 1998; Heyer, Franklin, Rivara, et al., 1992; Horwitz & McCall, 2005; Lipscomb & Li, 2001; McCall, Horwitz & Carr, 2007; Miller & Kaufman, 1998; Mujuru & Mutambudzi, 2007; Munshi, Parker, Bannerman-Thompson, et al., 2002; Parker, Clay, Mandel, et al., 1991; Parker, Carl, French, et al., 1994; Parker, Merchant & Munshi, 2002; Rauscher & Myers, 2008; Runyan & Zakocs, 2000; Runyan, Schulman, Dal Santo, et al., 2007; Vela Acosta, Sanderson, Cooper, et al., 2007; Weller, Cooper, Tortolero, et al., 2003; Woolf & Flynn, 2000; Zierold & Anderson, 2006a-c; Zierold, Garman & Anderson, 2004). These studies mostly included annual or multiyear surveys, but some used surveillance systems based on emergency department data (Miller & Kaufman) or labor department records on workers' compensation claims (Belville, et al.; Delp, et al.). Some analyses were specific to agricultural or nonagricultural industries (Dunn, et al.; Rauscher, et al.; Runyan, et al.; Zierold & Anderson; Zi-

Table 1

Occupational Injury/Illness Among Minors & Students

Minors and students age 21 and younger reporting a work-related injury or illness occurring on campus and requiring medical attention ($n = 285$) to the New Jersey Department of Education, Nov. 1, 1999, to May 1, 2008.

Variable	Categories	No. of injuries ($n = 285$, a subset of all injuries $N = 1,600$) ^a	Percent (of $n = 285$)	Percent of all injuries ($N = 1,600$)
Gender	Female	73	25.7	21
	Male	211	74.3	78
Age group	< 14 years old	2	0.7	3%
	14-15 years old	64	23.7	19%
	16-17 years old	141	52.2	49%
	18 years old	41	15.2	15%
	> 18 years old	22	8.2	14%

Note. The number of missing values in the reduced data set ($n = 285$) was one for gender, 15 for age.

erold, et al.), retail or service jobs, and homebuilding and construction (Weller, et al.). These published studies did not distinguish supervised, school-sponsored work experiences, including cooperative education and volunteer experiences, from unsupervised employment of minors, and did not focus on disparities and time of day.

This article describes the strengths, inherent limitations and challenges of the current incident reporting system managed by the NJ Safe Schools Program. This is the only youth-worker-focused, school-based, state-mandated injury surveillance system in the U.S.

Between July 1999 and May 2008, 1,600 incident reports were received; 285 (~90% of total) were reported to have occurred on school grounds and during school or approved SLE hours to students either in grades 9 to 12 or labeled “adults” (age 18 to 21), including special-needs students. In light of present public health concerns, the research team focused on those data and as illustrative examples examined potential gender and/or age-related disparities and reported time of day; no race/ethnicity data were collected.

The team also compared these selected results with conditions dictated by existing state and federal child labor and wage and hour laws. Analyses and comparisons can inform SH&E professionals who train adolescents and young adults and/or their teachers and employers, and SH&E professionals and worksite managers who supervise young workers. The goal is to enhance contents of, or create new training materials, and incident reporting and investigation strategies.

Study Methods

Aggregate analyses based on the data resulting from incident reporting requirements dictated by state law were granted exempt status for human subjects review at the University of Medicine and Dentistry of NJ (UMDNJ) School of Public Health.

Data Source & Population at Risk

NJ public and private schools for the disabled are subject to requirements of the state Department of Education, Office of Career and Technical Education (NJDOE-OC TE) per Administrative Code 6A:19-6.6

Table 2

On-Campus Injury/Illness Among Minors & Students

Minors and students age 21 and younger reporting an injury or illness occurring on campus and requiring medical attention to the New Jersey Department of Education, by gender and time of day^a, Nov. 1, 1999, to May 1, 2008.

Table 2a: Injuries During Typical School Hours, by Gender

Time	Male		Female		Total	
	No.	Percent within males	No.	Percent within females	No.	Percent of total
8:00-8:59 a.m.	26	12.3%	8	11.0%	34	11.9%
9:00-9:59 a.m. ^b	68	32.2%	28	38.4%	96	34.0%
10:00-10:59 a.m.	40	19.0%	15	20.5%	55	19.3%
11:00-11:59 a.m.	16	7.6%	2	2.7%	18	6.3%
12:00-12:59 p.m.	24	11.4%	11	15.1%	35	12.3%
1:00-1:59 p.m.	23	10.9%	3	4.1%	26	9.1%
2:00-2:59 p.m.	14	6.6%	6	8.2%	20	7.0%
Total count	211	100.0%	73	100.0%	284	100.0%

Table 2b: Injuries Outside of Typical School Hours, by Gender

Time	Male		Female		Total	
	No.	Percent within age group	No.	Percent within age group	No.	Percent of total
12:00-7:59 a.m.	4	40.0%	1	14.3%	5	29.4%
3:00-8:59 p.m.	3	30.0%	5	71.4%	8	47.1%
9:00-10:59 p.m.	2	20.0%	1	14.3%	3	17.6%
11:00-11:59 p.m.	1	10.0%	0	0%	1	5.9%
Total count	10	100.0%	7	100.0%	17	100.0%

Note. ^aNumber of students (minors) with a value missing for “time” was two, one per gender, and one each for age ≤ 16 and age 17-18. ^bOne student (one of 285) injured between 9:00 and 9:59 a.m. was of an undetermined gender.

(NJDOE, 2006) and, therefore, must submit one-page forms on reportable incidents within 5 working days. A *reportable incident* is defined as an injury or illness to students, staff and others if it:

- resulted from activities associated with CTE programs or courses and cooperative education experiences, which are paid SLEs providing students employment experience for school credit in the field for which they are preparing in their CTE program, on or off of school property; or, during travel to/from external training sites; and
- required treatment by a licensed physician.

Forms are submitted by schools. The NJ Safe Schools Program annually analyzes and reports on data to NJDOE-OC TE.

The original dataset consisted of injuries and illnesses (incidents) reported by NJ public secondary schools between December 1998 and May 2008. The injuries were reported on the standard, approved paper form (last updated fall 2005). The form is available online in PDF and Word formats and with instructions within the NJDOE-OC TE/NJ Safe Schools Program Incident Reporting Guide (last updated May, 2008) (NJDOE, 2008).

Young adults need to develop safe, effective work practices to successfully manage challenges encountered as adults in the labor force.



Names of students or staff members were removed from reports used in this study and each incident report was assigned a random ID number. Data collected on the forms include school name, date and time of incident recoded based on the hour of day, title of the class or job (industry/occupation) where the injury occurred, and whether the injury occurred on or off school property. Demographic data regarding the injured person collected on forms include age, gender and grade-level (for students), but not race/ethnicity. Note that not every student who participated in CTE courses enrolled in a full sequence of courses comprising a CTE program. Therefore, this article refers to students participating in CTE programs/courses and cooperative education experiences.

Inclusion/Exclusion Criteria

Incidents included in illustrative analyses for this article were those reported to have occurred to students in grades 9 to 12 or to students reported as being adults because the researchers assumed many of these students were special-needs learners through age 21. The research team also focused on incidents that occurred during school hours (8:00 a.m. to 3:00 p.m.) and on school grounds. This is because more than 8-in-10 incidents in the overall database did not report a specific location since it was not collected systematically until fall 2003 and was not required until fall 2005; among incidents with this information, about 9-in-10 were reported to have occurred on school grounds. For comparison, the team examined 17 reported incidents in the same time period, Nov. 1, 1999, to May 1, 2008, that occurred in SLEs outside normal school hours.

Quality Assurance/Quality Control Procedures

The researchers checked for inaccurate records across categorical and continuous variables. For continuous variables such as age and grade level, data were first sorted by each variable to evaluate the ranges of values and to verify that data points did not include errant categorical data.

Potentially erroneous data were verified by reviewing the original records. If correct input could not be verified from those records, the data point was recoded as missing. For categorical variables, if any values did not match the data dictionary and the original records could not verify data, then such records were eliminated. Overall, data were relatively clean, deletion was not required, and there were few missing data. Two students had missing values for time of injury and one was missing gender.

Data Analysis

The research team assessed the distribution of gender and age among incidents reported to have occurred during school hours on school grounds. Age was categorized as < 14, 14 to 15, 16 to 17, 18, > 18 years old or missing (i.e., not reported). The intra-school day hourly distribution of the time of injuries occurring to students on school grounds was also assessed. Age categories were established for these analyses as ≤ 16 , 17-18, ≥ 19 years old or missing, to allow comparisons with existing federal and state child labor laws.

The team then summarized the number of overall injuries by hour of day as well as the hour of the injuries distributed by age and gender. Then, the group summarized results for internal review, for school hours and outside school hours, overall and by age and/or by gender.

Multivariate logistic regression models also were conducted to evaluate whether any variables could serve as predictors of the hour of the injury (e.g., during school hours versus outside of school hours). Independent variables in the attempted regression models included age, gender and grade level of students, which were forced into the model. No statistically significant findings were observed (data not presented in this article). Data management was conducted in Excel and SAS Enterprise Guide 4.0 software was used for statistical analyses.

Results

Frequencies of injuries to individuals participating in NJ CTE programs and courses varied by both gender and age (Table 1, p. 52). About 3-in-4 (74.3%) were males, and students between age 16 and 17 incurred more than half of the reported injuries. This finding may be because most NJ CTE programs/courses and cooperative education experience participants fall into this age group, and also because students in this age group can work more hours than younger students. Additionally, many students graduate secondary school before turning 18, which may contribute, along with training and/or experience-based maturity, to the comparatively lower number of injuries observed among individ-

Table 3

On-Campus Injury/Illness Among Minors & Students

Minors and students age 21 and younger reporting an injury or illness occurring on campus and requiring medical attention to the New Jersey Department of Education by time of day^a and age group, Nov. 1, 1999, to May 1, 2008.

Table 3a: Injuries During Typical School Hours, by Age

Time	Age ≤ 16		Age 17-18		Age ≥ 19		Age undetermined		Total	
	No.	Percent within age group	No.	Percent within age group	No.	Percent within age group	No.	Percent within age group	No.	Percent of total
8:00-8:59 a.m.	22	16.4%	9	7.9%	1	4.5%	2	13.3%	34	11.9%
9:00-9:59 a.m.	53	39.6%	36	31.6%	4	18.2%	4	26.7%	97	34.0%
10:00-10:59 a.m.	31	23.1%	15	13.2%	6	27.3%	3	20.0%	55	19.3%
11:00-11:59 a.m.	5	3.7%	9	7.9%	3	13.6%	1	6.7%	18	6.3%
12:00-12:59 p.m.	10	7.5%	21	18.4%	3	13.6%	1	6.7%	35	12.3%
1:00-1:59 p.m.	4	3.0%	17	14.9%	2	9.1%	3	20.0%	26	9.1%
2:00-2:59 p.m.	9	6.7%	7	6.1%	3	13.6%	1	6.7%	20	7.0%
Total count	134	100%	114	100%	22	100%	15	100%	285	100%

Table 3b: Injuries Outside of Typical School Hours, by Age

Time	Age ≤ 16		Age 17-18		Age ≥ 19		Age undetermined		Total	
	No.	Percent within age group	No.	Percent within age group	No.	Percent within age group	No.	Percent within age group	No.	Percent of total
12:00-12:59 a.m.	0	0.0%	1	25.0%	0	0.0%	0	0.0%	1	5.9%
1:00-1:59 a.m.	0	0.0%	0	0.0%	1	14.3%	0	0.0%	1	5.9%
2:00-2:59 a.m.	1	33.3%	1	25.0%	0	0.0%	0	0.0%	2	11.8%
5:00-5:59 a.m.	0	0.0%	0	0.0%	1	14.3%	0	0.0%	1	5.9%
3:00-8:59 p.m.	2	66.7%	0	0.0%	4	57.1%	2	66.7%	8	47.1%
9:00-10:59 p.m.	0	0.0%	1	25.0%	1	14.3%	1	33.3%	3	17.6%
11:00-11:59 p.m.	0	0.0%	1	25.0%	0	0.0%	0	0.0%	1	5.9%
Total count	3	100%	4	100%	7	100%	3	100%	17	100%

Note. ^aThe number of students (minors) with a value missing for "time" was two, one for age ≤ 16 and one for age 17-18.

uals age 18 and older (an age group that includes special-needs students in NJ CTE programs).

Stratification of time-based injury data by gender demonstrated that injuries to male and female students followed the same general time patterns as did aggregated injury data (Table 2, p. 53). Most injuries to females and males occurred during the morning hours of a typical school-day schedule. There were 186 (65.2%) injuries between 8:00 and 11:00 a.m., and 97 between 9:00 and 10:00 a.m., for an incidence of injuries nearly twice as high as the time slot with the next-highest reported injury incidence.

Injuries to both males and females spiked slightly between 12:00 and 1:00 p.m. Since students and staff typically eat lunch during this time, other activities during lunch breaks, such as outdoor recreation and rough play, may have affected risk for injury; these factors are not identified through a standard variable in the current reporting system, although they often can be inferred from the text description.

Comparatively fewer students were injured during the afternoon hours—only 17 (5.6%) injuries occurred outside of school hours, with five overnight or early in the morning and 12 in the late afternoon or evening, of which eight occurred before 9:00 p.m. This finding was consistent with current laws and previous data illustrating a relatively

higher incidence of injuries among 16 and 17 year-olds in NJ (Table 1, p. 52).

Stratification of time-based injury data by age group (Table 3) also revealed temporal distribution patterns similar to those observed in the aggregated data (Table 2, p. 53). The relatively higher number of injuries during school hours occurred between 9:00 and 10:00 a.m. for all age groups except 19 and older, which includes special-needs students, students who started kindergarten late and students previously held back. For students age 19 and older, results were similar between 9:00 and 10:00 a.m. and 10:00 and 11:00 a.m.

Discussion

The observed gender distribution in reported injuries may imply one or more of the following:

- Males in CTE programs/courses and cooperative education experiences get injured more frequently than their female peers.

- Males are enrolled in relatively more hazardous CTE programs/courses even if they are in compliance with federal and state child labor laws.

- More males were enrolled in CTE programs/courses and cooperative education experiences based in NJ secondary schools.

In addition, one student's gender was reported as

undetermined. This may be due to either nondisclosure of gender by the teacher or administrative staff member who submitted the report, or failure of the reporting form to capture the student's true gender. Future research could address the viability of including additional options.

The largest number of reported injuries to minors occurred between 9:00 and 11:00 a.m. with another increase between 12:00 and 2:00 p.m. These results may be due to minors having a relative lack of attention early in the morning. Alternatively, since different courses across career clusters, areas and program pathways were offered throughout the day, perhaps relatively more hazardous tasks were conducted in the morning. Schedules, however, vary by local school districts in the state and by semester or season within school districts; the same is true across the U.S. The other noted increase in reported incidents may correspond to minors being at ease/relaxed after the lunch break, particularly if they did not have opportunities to participate in regular active recess immediately after lunch.

Future research should attempt to elucidate the types of activities NJ students in approved curricula in CTE programs/courses and cooperative education experiences typically undertake at different times of day, even if individual school districts set schedules. For example, if students perform more physically intensive and/or hazardous activities during the morning, then this scheduling could lead to relatively higher numbers of injuries during those hours within the school day. These findings may reflect a lower frequency of injury outside of school hours, relatively low reporting of injuries incurred during career-related activities outside of school hours, or a combination.

The researchers also observed an apparent acute increase in reported incidents between 2:00 and 4:00 p.m. when at school/on campus. This may be because classroom or shop work and training activities may be rapidly finishing then dismissing for the day and/or SLE work activities were starting off site if a student received prior approval of early release.

Only students age 17 and older incurred injuries during the evening and nighttime hours. This observation suggests that existing state and federal child labor and wage and hour laws, and/or resources for monitoring and enforcement, effectively prevented more injuries to younger students compared to older students participating in NJ CTE programs/cooperative education experiences.

Under existing laws, 16- and 17-year-olds cannot work as late as older students, whether on school nights or weekends or vacations. Federal and state wage and hour and child labor laws concerning 16- and 17-year-olds differ, with New Jersey having some stricter provisions (NJLWD, 2009a; USDOL-ESA-WHD, 2009a). For example, 14- and 15-year-olds are typically only allowed to work up to 18 hours per week (3 hours per school day) and not past 7:00 p.m. or before 7:00 a.m. on a school day; and 16- and 17-year-olds cannot typically work past 11:00 p.m. or before 6:00 a.m. on a school day.

In a survey conducted in 16 randomly selected schools in North Carolina, most minors under age 16 and those age 16 to 17 reported multiple types of working hour violations, without reference to whether this work was supervised by the school, regardless of work permit status (Dal Santo, et al., 2010). Violations reported were number of hours on a school day (more than 3 hours per day), number of hours per week (school week more than 18 hours, nonschool week more than 40 hours) and time of day (late night) (Dal Santo, et al.). Also, in retail and service industries, minors working later hours may be at increased risk for workplace violence, including assault and robbery. Another type of working hour violation previously assessed was work conducted off the clock or undocumented (Rauscher & Myers, 2008).

This research found a comparatively higher number of injuries for students age 16 and younger versus students age 17 to 18. This suggests that 16-year-old students may bear a disproportionately large burden of injuries related to participation in NJ CTE programs and cooperative education experiences.

One possible reason is federal and state regulations [e.g., hazardous occupations orders (HOs)] have some differences between nonagricultural and agricultural education occupations for this specific age group with respect to potential exposures to chemical and physical agents. HO violations are defined as performing a job task—including using specified pieces of equipment—prohibited by federal law by anyone younger than 18 years of age (Rauscher & Myers, 2008). HOs are defined differently in agricultural and nonagricultural occupations (NJLWD, 2009b-c; USDOL-ESA-WHD, 2009b-c), including some differences by age.

Since child labor and wage and hour law violations are typically related to situations where an adolescent has sustained an injury, state and local public health professionals can help periodically reevaluate existing laws and practices. Proposed updates should be based on accurate, precise surveillance such as these NJ data.

Future research should assess whether the comparatively higher number of injuries observed among 16-year-olds is due to students not yet learning from past mistakes, or 17- to 18-year-olds learning from past mistakes as they advance in their career-focused education. Typically, young workers lack experience and are still developing physically, emotionally and cognitively (Lies, 2010).

Recent community health survey-based surveillance in Canada among minors and young adults age 15 to 24 (Breslin & Pole, 2009) also reported higher injury rates among males compared to females. A cross-sectional phone survey of Canadian working youth age 14 to 18 reported more females than males received training, even if overall most workers were trained on equipment safety (Lewko, Runyan, Tremblay, et al., 2010). Future research should further explore gender-based disparities, including for specific race/ethnic groups.

The current incident surveillance system for school-sponsored SLEs in NJ, and select analyses in

this article based on data collected during the first decade, have specific limitations to be acknowledged and/or potentially addressed in the future. First, NJ Safe Schools Program cannot independently verify certain details, given both the self-reported and cross-sectional nature of these data. Although the incidents must be reported, enforcement is limited and some underreporting is likely. Information bias was possible, even if an incident meeting the criteria for reporting must be documented within 5 business days, because the law is interpreted to mean 5 business days from the time school staff or administration are made aware of the incident, which may not be the same day or next day due to delayed onset of symptoms or clinical diagnosis. Overall, however, there were few missing data in the final data set for the parameters analyzed.

Second, sample sizes were small in some categories, which for occupational incident data involving minors have been shown in another study to potentially influence the statistical significance of results (Rauscher & Myers, 2008).

A third limitation is the lack of longitudinal data on these students; there is no way to follow up on short-term or long-term outcomes. As a result, several interesting research and practice questions remain unanswered, such as whether the reported incident disrupted the student's curriculum and work experience, or whether the student had any subsequent symptoms, comorbidity and/or permanent disability due to the reported injury.

The fourth limitation is that the research team could not accurately and precisely determine a denominator (person-time values) to calculate rates. To date, NJDOE has not systematically collected data from the 21 vocational-technical school districts and/or other secondary schools annually on numbers of SLE students.

The final limitation is that no race/ethnicity data and limited details about exposure agents are collected. Future versions of the reporting form, including online access and completion of a form with greater readability, can incorporate such questions.

The primary strengths of the current surveillance system and present analyses were based on data quality. These data concern incidents reported across New Jersey during a relatively wide period. The currently required incident form (last updated for fall 2005) has provided many details on the injury or illness and the person involved.

Conclusion

In conclusion, young adults need to develop safe, effective work practices based on existing state and federal child labor and wage and hour laws to successfully manage challenges encountered as adults in the labor force. The data analyses presented here can inform new or proposed updates by SH&E professionals in collaboration with agencies and education professionals to state-led, school or worksite-based occupational injury surveillance. Data would then inform future regulations and new or enhanced safety and health

training materials targeting both youth workers and adult teachers and staff. Future SH&E research should further investigate unique challenges to safe working practices faced by students in this age demographic, including more information on actual exposures to agents of concern in current and emerging industries. **PS**

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