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The state of construction safety and health education at higher education institutions in the Western Cape, South Africa

Abstract

The Occupational Health and Safety Act (OHSA) 85 of 1993 requires all employers in South Africa to provide and maintain a working environment that is safe and without risk to the health of their employees. Additionally, OHSA requires employers to provide such information, instructions, training and supervision as may be necessary to ensure the health and safety at work of their workers. Several studies have confirmed a well-established link between safety training and the performance of companies. High performing organizations were found to invest a larger percentage of payroll costs in training compared to the recommended industry norm. Construction related programs at universities and technikons produce graduates who either take up managerial and supervisory positions within construction firms or establish their own construction companies. The pivotal role of management in driving and promoting safety within their organizations is well documented. In order to comply with the requirements of OHSA these graduates need to be able to recognize, avoid and prevent unsafe conditions on the construction sites that they will be involved with. This article gives an insight into the findings and exploratory studies of safety and health education at higher educational institutions in the Western Cape province of South Africa as well as the views of students on construction safety. Preliminary results suggest that construction related programs do not adequately prepare students to be able to ensure the safety and health of workers on construction sites. Courses make scant reference to the provisions of OHSA and responsibility for worker safety.

Keywords: Education, training, worker safety, management.

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DIE STAND VAN KONSTRUKSIE-VEILIGHEID EN GESONDHEIDSOPLEIDING BY HOËRONDERWYSINSTELLINGS IN DIE WESKAAP-PROVINSIE

Die Wet op Beroepsgesondheid en Veiligheid, 85 van 1993, vereis dat alle werkgewers in Suid-Afrika 'n veilige werksomgewing sonder enige gesondheidsrisiko vir hulle werknemers skep. Hiermee saam vereis die Wet dat werknemers voorsien moet word van inligting, instruksies, opleiding en toesig wat nodig is om die gesondheid en veiligheid van die werkers te verseker. Verskeie studies onderskryf 'n goed gevestigde verband tussen veiligheidsopleiding en werksverrigting van maatskappye. Organisasies met hoë verrigting investeer skynbaar 'n groter persentasie aan loongeld aan personeelopleiding vergeleke die aanbevole bedryfsnorm. Konstruksie-gerelateerde programme by universiteite en tegniese skole voorsien gegradueerdes wat óf bestuurs- en toesighoudende posisies binne die konstruksiebedryf vul of hulle eie konstruksie- en maatskappye stig. Die vraag waarom die bestuur en bevordering van veiligheid binne die organisasies draai, is goed gedokumenteer. Om aan die vereistes van die Wet op Beroepsgesondheid en Veiligheid te voldoen, moet dié gegradueerdes in staat wees om onveilige toestande te herken, te verhoed en voorkomende maatreëls op die konstruksie-terreine daar te stel. In hierdie artikel word die bevindinge van 'n ondersoek na veiligheid en gesondheidsopleiding aan hoërsonderwysinstansies in die Wes-Kaap ondersoek asook die menings van studente met betrekking tot konstruksie-veiligheid weer te gee. Volgens voorlopige bevindinge wil dit voorkom asof konstruksie-gerelateerde programme nie voldoende voorsiening maak om die veiligheid en gesondheid van werkers op konstruksie-terreine te verseker nie. Kursusse maak tot 'n mindere mate melding van die voorskrifte van die Wet en die verpligtinge wat op bestuur rus ten opsigte van beroepsveiligheid.

Sleutelwoorde: Onderrig, opleiding, werkeveiligheid, bestuur.

Introduction

There is a close relationship between education and labour conditions. As managers with higher education are attracted into organizations, they bring with them core values and standards that influence organizational culture. If the importance of construction worker safety and safety management is recognized and included in the education programs of these managers an improved safety culture will be created. Consequently construction worker safety performance on construction sites will improve.

The South African government has encapsulated the essence of this pivotal relationship in the Occupational Health and Safety Act (OHSA) 85 of 1993. In terms of OHSA clause 8(1) all employers in South Africa are required to provide and maintain a working environment that is safe and without risk to the health of their employees. Additionally, OHSA clause 8(2)(e) requires employers to provide such information, instructions, training and supervision as may be necessary to ensure the health and safety at work of their workers. Several studies have confirmed a well-established link between safety training and the performance of companies. For this reason high performing companies invest larger percentages of their payroll cost in training than the recommended industry norm.

The approach taken by top management in an organization influences the approach taken by subordinates (Marshall 1994; Haupt 2001). A study by the National Institute of Occupational Health and Safety in the United States found that successful safety practices were influenced by a strong management commitment to safety expressed through active involvement in program implementation and demonstrated concern for worker well being. Many managers have discovered that if they emphasized safety by becoming safety conscious themselves, it was likely that their organizations would have good safety records. Since management is responsible for the creation and maintenance of the working environment and activities into which workers must fit and interact in, they can contribute significantly to controlling unsafe activities and conditions which have been cited as the direct causes of accidents (Holt 2001; Hinze 1997).

Construction related programs at universities and technikons produce graduates who either take up managerial and supervisory positions within construction firms or establish their own construction companies. The pivotal role of management in driving and promoting safety within their organizations is well documented (Hinze 1997; Levitt & Samelson 1993; Holt 2001; Coble *et al* 1999; Mufti 1999). To play this important role they have to be well educated and qualified in construction safety and health matters. In order to comply with the requirements of OHSA these graduates need to be able to recognize, avoid and prevent unsafe

conditions on the construction sites that they will be involved with. This article discusses the findings of exploratory studies of safety and health education at higher education institutions in the Western Cape province of South Africa on the one hand, and the views of students on construction safety on the other.

Research methodology

In order to obtain data regarding the extent to which safety is integrated into construction programs that produce the various construction professionals, a survey was developed that sought some basic information. The questionnaire used for this purpose was designed to gather information from universities and technikons¹ in the Western Cape province of South Africa that offered programs in construction related fields. Of the five higher education institutions in the region, only three offered construction programs, namely one university and two technikons. An additional survey was conducted among third year construction management students at one of the technikons to establish the extent of their exposure to safety and health issues in their academic courses and their level of knowledge of construction safety and health. These findings were compared with relevant literature.

Both questionnaires were self-administered. In the case of the higher education institutions the questionnaire was delivered to the academic head of the relevant department² or faculty³ who, after completing it, faxed it to the researcher. All three institutions offering construction programs responded (100%). The student survey was conducted during one of their class sessions. All 68 students present at the time completed the questionnaires (100%).

Results of institution survey

Higher education institutions offered programs in a wide range of construction-related disciplines. From *Table 1* it is evident that all three institutions offered programs in the disciplines of architecture, construction management, civil engineering, electrical engineering and quantity surveying. Two institutions offered programs in mechanical engineering, town planning, and urban and regional planning. None of the institutions offered programs in architectural engineering, facilities management, structural engineering and value engineering.

1 The US equivalent of a technikon is a technical university

2 The US equivalent of a department is a school, e.g. School of Building Construction.

3 The US equivalent of a faculty is a college, e.g. College of Architecture.

Table 1: Disciplines in which institutions offer programmes

Discipline	No of institutions
Architecture	3
Building surveying	1
Construction management	3
Civil engineering	3
Electrical engineering	3
Interior design	1
Maintenance management	1
Mechanical engineering	2
Project management	1
Property development	1
Property management	1
Quantity surveying	3
Town planning	2
Urban and regional planning	2

Table 2 indicates the number of institutions that offer courses on safety and health at various levels of study in a number of disciplines. Students at one institution were exposed to safety and health courses during each of the four years of study in architecture, construction management, property development and property management. However, students studying civil engineering, electrical engineering, interior design, mechanical engineering, town planning, and urban and regional planning had no exposure to safety and health throughout their entire academic programs. Where safety courses were offered they covered the provisions of OHSA of 1993 and the National Building Regulations. One institution reported that while the legislation was referred to in classes there were no focused learning programs for safety and health.

None of the institutions offered a course that was wholly devoted to construction safety. Rather, reference was made to safety in courses such as construction management, law and technology. One institution indicated that within the next three years in safety and health in the final years it would introduce courses of study in the disciplines of building surveying, construction management, maintenance management, project management, property development, property management, quantity surveying and value engineering. Reasons given by institutions for presently offering safety and health courses as part of their curriculum included the recognition of their importance both in construction *per se* and as an indicator of sustainability in construction.

Table 2: Disciplines in which institutions offer courses focusing on safety and health

Discipline	Year 1	Year 2	Year 3	Year 4
Architecture	1	1	2	2
Building surveying			1	1
Construction management	1	1	3	2
Maintenance management				1
Project management		1	1	1
Property development	1	1	1	1
Property management	1	1	1	1
Quantity surveying		1	2	2

Only one institution regarded its graduates as being adequately trained or qualified to deal with construction safety and health issues. While no specific course was offered, safety and health issues were integrated into courses such as construction technology and management. The other institutions concurred that students were only given a broad overview in terms of understanding the main principles, knowing where to get information, and applying the principles.

Results of student survey

In respect of the importance of various parameters to the success of a building construction project, 80,9% of students regarded completion without injury or fatality as being either fairly or very important. When the means of the responses were compared, this parameter ranked fourth out of the five parameters. Completion on time or within contract period, within cost or budget, and meeting desired quality standards, ranked above safety. These findings are shown in *Table 3*.

In terms of their understanding of the provisions of OHSA, 95,2% of the students claimed that contractors were responsible for worker safety on construction sites. From *Table 4* it is evident that 57,4% of the students claimed to be aware of the provisions of OHSA of 1993. They absolved architects, designers, suppliers, clients and engineers from any responsibility for construction safety. This finding is not entirely surprising since safety and health issues were not covered by any of the education institutions in their engineering programs. This finding is shown in *Table 5*.

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Table 3: The importance of project success parameters

Parameter	1	2	3	4	5	Total	Mean	Std. dev.
Time			2 2,9%	11 16,2%	55 80,9%	68 100,0%	4,7794	0,4839
Cost			7 10,3%	4 5,9%	57 83,8%	68 100,0%	4,7353	0,6376
Quality	1 1,5%		6 9,0%	15 22,4%	45 67,2%	67 100,0%	4,5373	0,7849
Safety		2 2,9%	11 16,2%	6 8,8%	49 72,1%	68 100,0%	4,5000	0,8725
Utility		1 1,5%	5 7,6%	25 37,9%	35 53,0%	66 100,0%	4,4242	0,7030

Table 4: Awareness of provisions of OHSA

	Frequency	Valid percent
Yes	39	57,4%
No	29	42,6%
Total	68	100,0%

Table 5: Responsible for safety

	Frequency	Valid percent
Contractor	60	95,2%
Worker	3	4,8%
Total	68	100,0%

With regard to who should be responsible for worker safety on construction sites, most students (85,1%) selected contractors as their most preferred party. The findings in *Table 6* confirm the earlier finding in *Table 5*. Interestingly, workers were preferred above engineers, designers, clients and suppliers.

Table 6: Party preferred for safety management

Party	1	2	3	4	5	Total	Mean	Std. dev.
Contractor	3 4,5%		1 1,5%	6 9,0%	57 85,1%	67 100,0%	4,7015	0,8879
Worker	2 3,6%	4 7,1%	7 12,2%	10 17,9%	33 58,9%	56 100,0%	4,2143	1,1396
Engineer	12 22,6%	7 13,2%	12 22,6%	13 24,5%	9 17,0%	53 100,0%	3,0000	1,4142
Designer	18 34,6%	6 11,5%	18 34,6%	6 11,5%	4 7,7%	52 100,0%	2,4615	1,2904
Client	28 53,8%	7 13,5%	8 15,4%	7 13,5%	2 3,8%	52 100,0%	2,0000	1,2680
Supplier	30 58,8%	6 11,8%	11 21,6%	3 21,6%	1 2,0%	51 100,0%	1,8039	1,0958

Students opined that management had the most impact (63%) on construction worker safety followed by foremen (48,2%). This finding is shown in *Table 7*.

Table 7: Party with most impact on construction safety

Party	Most impact	Less impact	Least	Total	Mean	Std. dev.
Management	34 63,0%	3 5,6%	17 31,5%	54 100,0%	1,6852	0,9281
Foreman	26 48,2%	14 25,9%	14 25,9%	54 100,0%	1,7778	0,8393
Supervisor	13 23,6%	35 63,6%	6 10,9%	55 100,0%	1,9273	0,7163

From *Table 8* it is clear that students believed that construction (56,1%) was the industry most responsible for work-related accidents and fatalities. This finding is in line with the statistics in most countries.

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Table 8: Industry responsibility for accidents and fatalities

Industry	Frequency	Valid percent
Manufacturing	1	1,8%
Agriculture	1	1,8%
Construction	32	56,1%
Mining	18	31,6%
Transportation	5	8,8%
Total	57	100,0%

The responses in *Table 9* indicate that most students (90,9%) thought new workers were most likely to be injured on construction sites. This result concurs with the findings of several other studies.

Table 9: Workers most likely to be injured

Type of worker	Frequency	Valid percent
Experienced worker	6	9,1%
New worker	60	90,9%
Total	66	100,0%

Table 10: The time of day when accidents are most likely to occur

Time of day	Frequency	Valid percent
Monday morning before tea	31	50,8%
Monday before lunch	3	4,9%
Monday after lunch	4	6,6%
Monday before afternoon tea	2	3,3%
Tuesday before lunch	1	1,6%
Tuesday before afternoon tea	1	1,6%
Friday morning before tea	1	1,6%
Friday before lunch	1	1,6%
Friday after lunch	11	18,0%
Friday before afternoon tea	6	9,8%
Total	61	100,0%

The majority of students (50,8%) opined that Monday morning before tea was the time of day when accidents were most likely to occur (*Table 10*).

Table 11: When workers should be trained

Time	Frequency	Valid percent
Before being employed for the first firm by the firm	27	43,5%
Before new or unfamiliar work on a project is commenced	7	11,3%
At regular intervals	28	45,2%
Total	62	100,0%

Table 11 indicates that students were equally divided on the question whether workers should be trained before being employed for the first time by firms (43,5%) or at regular intervals (45,2%). No students believed that training should occur after an accident occurs.

Most students (80,3%) believed that safety meetings should be held weekly. No students thought that these sessions should never be held or held quarterly or annually. This finding is shown in Table 12.

Table 12: Frequency of safety meetings

Time	Frequency	Valid percent
Daily	6	9,1%
Weekly	53	80,3%
Monthly	7	10,6%
Total	66	100,0%

Students were asked to rank 21 actions in terms of how these would potentially improve construction worker safety. The data in Table 13 indicate that disincentive schemes and attitude surveys would not improve worker safety.

The other 19 actions would all contribute to improvement to some degree. After comparing the means of their responses, the six actions considered to potentially improve safety the most were worker training, management training, safety inspections, safety meetings, safety plans, and employment of safety staff. An interesting feature of these results is the perceived importance of management commitment (ranked 10th).

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Table 13: Factors to improve construction worker safety

Factor	Will not improve safety	Will slightly improve safety	Will significantly improve safety	Mean	Std. dev.
Worker training	8 11,8%	6 8,8%	53 79,4%	2,7059	0,7342
Management training	13 20,3%	24 37,5%	26 40,6%	2,6875	3,9234
Safety inspections	6 9,0%	10 14,9%	51 76,1%	2,6716	0,6369
Safety meetings	7 10,4%	16 23,9%	43 64,2%	2,5821	0,7416
Safety plans	7 10,6%	14 21,2%	45 68,2%	2,5758	0,6807
Employment of safety staff	11 16,4%	9 13,4%	46 68,7%	2,5672	0,8206
Personal protective equipment	9 13,4%	15 22,4%	43 64,2%	2,5075	0,7256
Walk-through inspections	8 11,9%	19 28,4%	39 58,2%	2,5075	0,7662
Use of safety checklists	12 17,6%	16 23,5%	39 57,4%	2,4412	0,8355
Management commitment	14 20,9%	12 17,9%	41 61,2%	2,4030	0,8176
Emergency plans	10 15,6%	20 30,3%	34 53,1%	2,3750	0,7454
Orientation of workers	18 26,5%	8 11,8%	42 61,8%	2,3529	0,8770
Retraining of workers	11 16,7%	23 34,8%	31 47,0%	2,3485	0,8132
Medical examinations	17 25,8%	19 28,8%	30 45,5%	2,1970	0,8269
Larger safety budget	14 20,9%	30 44,8%	23 34,3%	2,1343	0,7364
Incentive schemes	13 20,6%	29 46,0%	21 33,3%	2,1270	0,7294
Drug screening	19 29,2%	22 33,8%	23 35,4%	2,1077	0,8861
Document and record analysis	13 19,4%	36 53,7%	18 26,9%	2,0746	0,6812
Benchmarking	15 23,4%	34 53,1%	15 23,4%	2,0000	0,6901
Disincentive schemes	18 28,6%	36 57,1%	9 14,3%	1,8571	0,6440
Attitude surveys	23 34,8%	33 50,0%	10 15,2%	1,8030	0,6843

Most students (55,2%) indicated that they had not been adequately exposed to construction safety issues during their academic programs at higher education institutions. These findings are shown in *Table 14*.

Table 14: Adequacy of exposure to construction safety issues in academic programme

Response	Frequency	Valid percent
Yes	29	43,3%
No	37	55,2%
Not sure	1	1,5%
Total	67	100,0%

Students offered several suggestions in respect of preparing them to contribute to improving construction worker safety. Their suggestions are shown in *Table 15*. A large number of students (40%) felt that spending time on construction sites and observing safety practices during the execution of construction activities would be the most beneficial action to take. The other favoured action was learning more about health and safety through courses and workshops.

Table 15: Suggestions of students

Suggestions	Frequency	Valid percent
Learn more about health and safety	19	31,7%
Improved communication	1	1,7%
More research	3	5,0%
Plan for safety	1	1,7%
First-aid training	3	5,0%
Know legislation	3	5,0%
Taught as separate stream or subject	4	6,7%
Spend time on site and observe practices	24	40,0%
Increased awareness	2	3,3%
Total	60	100,0%

Discussion

Higher education institutions indicated that they did not offer any courses wholly devoted to construction safety issues. Rather, construction safety issues were integrated into a limited number of courses. Even then students were only given a broad overview. Viewed against this cursory and scant treatment of construction safety, it is no surprise that completion of projects without the loss of life or a limb has less importance in the minds of management students than have the traditional project parameters of time, cost and quality. Several authors (Hinze 1997; Smallwood & Haupt 2000) have argued that the safety performance of the construction industry will only improve when safety is accorded the same importance as these parameters. A study conducted by Suckarieh and Diamantes (1997) found that universities in the United States devote little course time to the topic of safety in construction projects.

While educational institutions make reference to legislation such as OSHA, 1993 in their courses, the impression is created in the minds of students that only contractors are responsible for safety. In fact they prefer contractors to be the parties that should be responsible for safety. The other participants in the construction process are consequently absolved from any responsibility. This finding is contrary to international trends in safety management in terms of which the responsibility for safety has been redistributed to include all the participants in construction (Coble & Haupt 1999; Smallwood & Haupt 1999, 2000).

Whereas several studies have shown that foremen have the greatest direct impact on the safety and health of their workers (Hinze 1997; Levitt and Samelson 1993), students felt that management had the most direct impact. This implies that educational institutions have a responsibility to provide students with the knowledge and training to be able to make that impact – a responsibility not yet recognized or accepted – a finding confirmed by Suckarieh and Diamantes (1997) in their study.

Students recognized that construction was the industry most responsible for work-related accidents, injuries and fatalities. Hinze (1997), Haupt (2001) and many others support these findings. Similarly, students opined that new appointees were the worker cohorts most likely to be injured on sites. Hinze (1997) and Levitt and Samelson (1993) support this finding. Monday mornings before tea, usually around 10h00 (in South Africa), was regarded as the day and time when accidents were most likely to occur. This finding concurs with Hinze (1997). Like many authors, students recognized the importance of training and orientation of new hires appointees.

While the pivotal role of management commitment is well documented in safety literature, students failed to recognize this role when ranking 21 actions that could improve construction worker safety. Students confirmed the admission of the educational institutions concerning their inadequate exposure to construction safety. Time spent on construction sites was cited as the best alternative to this failing of their alma maters.

Conclusion

This exploratory study confirmed that higher educational institutions are not preparing construction professionals adequately for their future construction safety responsibilities. Consequently students fail to recognize the pivotal role that they play in improving construction safety and health as managers of the construction process. To their credit students have demonstrated a reasonable understanding of several of the key issues despite the scant reference to construction safety in their academic programs. While educational institutions acknowledge this deficiency, a more concerted effort is necessary to incorporate safety and health issues at all levels of study and across all disciplines. Only then will South African construction professionals be able to influence construction safety and health performance in the industry in a positive way. Programs without formal educational training in construction safety will place graduating construction professionals at a severe disadvantage before and after final graduation.

References

- AL-MUFTI, M.A.
1999. College's emphasis on construction safety. In: Singh, Hinze & Coble (eds). *Implementation of safety and health on construction sites*. Rotterdam: Balkema, pp. 277-284.
- COBLE, R., HINZE, J., McDERMOTT, M. & ELLIOTT, B.
1999. College's emphasis on construction safety. In: Singh, Hinze & Coble (eds). *Implementation of safety and health on construction sites*. Rotterdam: Balkema, pp. 257-264.
- HAUPT, T.C. & COBLE, R.
1999. Safety and health legislation in Europe and United States: a comparison. In: Gottfried Trani & Alves Dias (eds). *Safety coordination and quality in construction*. Milan: Polytechnic of Milan, pp. 159-164.

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- HAUPT, T.C. & SMALLWOOD, J.J.
1999. Implications for South Africa of safety and health initiatives in Europe and the United Kingdom. In: Gottfried, Trani & Alves Dias (eds). *Safety coordination and quality in construction*. Milan: Polytechnic of Milan, pp. 165-174.
- HINZE, J.
1997. *Construction safety*. Upper Saddle River, New Jersey: Prentice-Hall.
- HOLT, A.
2001. *Principles of construction safety*. Oxford: Blackwell Science Ltd.
- LEVITT, R. & SAMELSON, N.
1993. *Construction safety management*. New York: John Wiley & Sons, Inc.
- MARSHALL, G.
1994. *Safety engineering*. American Society of Safety Engineers.
- SMALLWOOD, J.J. & HAUPT, T.C.
2000. Safety and health teambuilding. In: Coble, Hinze & Haupt (eds). *Construction safety and health management*. Upper Saddle River, New Jersey: Prentice-Hall, pp. 115-144.
- SUCKARIEH, G. & DIAMANTES, J.
1997. Educating construction management students in safety. In: Alves Dias & Coble (eds). *Implementation of safety and health on construction sites*. Rotterdam: Balkema, pp. 567-576.