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‘It is only the instructed and trained overlooker and artisan that can successfully compete against foreign skills’: Nineteenth-century adult technical and vocational education offered by the Yorkshire Union of Mechanics’ Institutes and the foundation of further education curricula

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Abstract

Further education colleges in England and Wales have offered government-recognised courses and qualifications which receive public funding and have included technical and vocational courses since their foundation in the early twentieth century. Yet developments in such curricula and qualifications are not new and they can be traced back to the first half of the nineteenth century when working-class adult education was first being offered through the then evolving mechanics’ institutes. Historians have argued that nineteenth-century British mechanics’ institutes failed to offer working-class adults education and qualifications, instead providing scientific lectures for the professional classes. The assumption has been that it was not until the early twentieth century that technical schools started to offer what is often referred to today as vocational education and training. This article questions these views, using the annual reports of the Yorkshire Union of Mechanics’ Institutes between the 1830s and 1880s as evidence. The article highlights how several Yorkshire Union mechanics’ institutes, many the forerunners of further education colleges, were responsive to offering curricula and qualifications relevant to British industrialisation and the working classes, a tradition which continues today through post-14 education and training.

Keywords

history; curriculum; technical education; vocational education; adult education; mechanics' institutes

Introduction

Historians have tended to see the role of the nineteenth-century mechanics' institute movement as being on the periphery of supporting British working-class adult education. In particular, they argue that many institutes offered high-level scientific lectures and therefore alienated the masses, in favour of the few. H. C. Barnard (1966), for example, believed that mechanics' institutes failed to offer working-class adults relevant subjects as 'they provided not so much vocational training for working men, as giving scientific lectures to the upper and middling classes and social facilities for members of the professional and middle class'. In any case, as Lucas (2004) points out, while they did not wish to prevent the working classes attending, mechanics' institute committees did not win credibility as genuinely mass adult education providers because their major emphasis was access to scientific knowledge 'through public lectures, the reading of tracts and pamphlets' and therefore 'assumed a high level of literacy' of those who attended them.

In some parts of the country, mechanics' institutes were organised into unions for mutual support. The Yorkshire Union, established in 1838 by Edward Baines, was the first to be founded and it finally ceased operating in 1924. The Lancashire and Cheshire Union was established by Benjamin Heywood of the Manchester Institute in 1839 and continued until the 1950s, but was by then a consultancy and examination board for the local authority. The Kent Union and the Birmingham-based Midland Union were formed in 1847, with the Northern Union (Northumberland and Durham) and the Scotland Union being formed in 1848. The Devon and Cornwall Union was formed in 1850 and the Leicestershire Union in 1853. With the exception of the Yorkshire, Lancashire and Cheshire and the Northern Unions, all others were short-lived (Popple, 1962).

Edward Baines Junior, the Whig editor of the *Leeds Mercury*, first came up with the notion of a Union of Mechanics' Institutes and published an article in the *Leeds Mercury* in 1837 where he expressed his concern about the lack of organisation of teaching within the mechanics' institutes. By organising the institutes into unions, Baines thought it would be possible to appoint permanent lecturers who would teach one or two subjects from mechanics, chemistry, political economy and statistics (Tylecote, 1957). It was envisaged that there would be:

an unbroken series of tuition on each subject, conducting the student from its simple elements to its higher branches; in this manner constituting each institute a complete school for every branch of art or science necessary to the joiner, the mason, the builder, the engineer, the machine-maker, the dyer, and the manufacturer (West Riding Union of Mechanics' Institutes, 1838).

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As a result of a meeting in Leeds in December 1837 it was agreed that the aim was to appoint good lecturers whose salaries could be paid out of the West Riding Union's membership funds. It was hoped that the Union, the forerunner of the Yorkshire Union, would support 'systematic and continuous study' through appointing permanent lecturers, particularly in chemistry, which was seen as an important subject in support of the woollen dye industry (Tylecote, 1957). Of the 635 institutes in the Yorkshire Union, few, if any, actually closed permanently (Annual Reports of the Yorkshire Union of Mechanics' Institutes).

During the period of this study, there were changes and developments that provide evidence that the mechanics' institutes of the Yorkshire Union did positively respond to the needs of British industry in offering technical and vocational education relevant to their working-class employees.

Individual Yorkshire Union institutes often, but not always, sent their own report to Leeds for publishing in the annual reports of the Yorkshire Union of Mechanics' Institutes. It is these accounts that have provided a wealth of information showing the developments in subjects and qualifications offered and provide insight into what was to become the foundation on which present-day technical and vocational qualifications have evolved. Using these annual reports, it has been possible to identify the response to the need for relevant technical and vocational education.

Early curriculum developments

The initial aim of the mechanics' institute movement was to provide scientific education for all and especially the industrial classes. At Derby, for example, the Mechanics' Institute had the support of William Nicol, 'one of the most experienced and skilled of English itinerant lecturers in this period', who gave a course of 15 lectures on *The Philosophy of Natural History* one year after the opening of the Institute in 1825. Similar arrangements were made at the Nottingham Mechanics' Institute, founded in 1837, where a well-known itinerant lecturer from London, T. Longstaff, gave frequent lectures on astronomy and meteorology and delivered others on chemistry, physiology, silk manufacture, railways, phonology, botany and printing. The Mechanics' Institute at Newcastle, which was established in 1824, introduced classes in chemistry, higher mathematics and phrenology. Over 1,000 people attended the Manchester Mechanics' Institute to listen to John Davis give a lecture on natural philosophy in 1829 (Inkster, 1975).

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The Sheffield Mechanics' Institute was established in 1832. Its main objective was the 'instruction in the various branches of science and art' and it offered natural philosophy lessons on a weekly basis between 1838 and 1841, supported with itinerant teachers delivering public lectures in science. Lectures were also given in

phrenology, astronomy, mechanics, chemistry and electricity and were delivered by local men including a chemist, a botanist, a surgeon and a steel manufacturer. These short courses, however, were very intensive and did not allow for much discussion and debate (Inkster, 1975).

The scientific public lectures and classes at Sheffield, as elsewhere, were informative and well delivered. Both school and university curricula were still associated with the arts, classics and law, so mechanics' institutes gained reputations in their early years for organising public lectures on scientific subjects. However, their depth and relevance did not encourage the working classes to attend either the lectures or classes, even with the relatively cheap entrance rates and fees. Many working-class attendees found the subject matter difficult to follow as many had not had any sort of elementary education.

A further example was the Darlington Mechanics' Institute, where in 1848 the Committee organised several lectures including one on the *Advantages of Knowledge* and a second on *The Apparent Discrepancy, but Real Harmony between the Discoveries of Modern Science*. These lectures were theory-based science-related subjects which required an advanced understanding in order to appreciate them and thus discouraged the working class from attending (Yorkshire Union of Mechanics' Institutes, 1849).

Further curriculum developments

James W. Hudson (reprint 1969) was correct when he observed in 1851 that the curriculum was 'not suitable or relevant for the mechanic and that it had become the cause of the national mechanics' institute movement's troubles. George Barclay, writing several years later, stated that the 'fall of the movement in terms of the incomprehension of members at scientific lectures was due to their lack of elementary education' (Inkster, 1976). This was the crux of the problem, for without a good understanding of science, no matter how interesting or relevant to the new industrial age, such classes and public lectures were rarely of interest to, or attended by, the working classes.

Thus, if mechanics' institutes were to survive and support their original aims of offering working-class education, their committees needed to introduce relevant classes at elementary level in order to encourage attendance and support members with more advanced level subjects such as science and mechanics. The Yorkshire Union responded by offering relevant curricula to support local industry and this may have been a major factor why this union was more successful than several others. Tylecote's (1957) distinguished work on several mechanics' institutes located in the textile districts of Lancashire and Yorkshire expressed the belief that there was a 'missionary zeal' in encouraging mechanics' institutes to develop and support their local working class with their education.

The Society of Arts in 1853, following the shock findings of the Great Exhibition which raised concerns about Britain's industrial supremacy, stated that it was important that industrial instruction should be made available for workers

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in order to educate them so they could design and build machines rather than 'resort to machine-breaking [and] rick-burning, becoming the game keeper rather than the poacher and having an appreciation for all things mechanical' (Denis, 2001). In the same year, the Department of Science and Art was established; it was administered by the Board of Trade. By 1857, the Department had identified the importance of working men having a better understanding of machinery and how it worked, as a result of the findings following the Great Exhibition (Angles, 1964). It offered nationally recognised examinations, particularly in drawing classes, which were offered at many mechanics' institutes (Denis, 2001).

In the case of the Yorkshire Union institutes, Keighley Mechanics' Institute had been offering classes in drawing as early as 1845, as well as writing, arithmetic, geography and grammar. Indeed, writing and arithmetic were the most popular subjects studied (see Table 1 below).

The Institute had by 1849 also established several advanced classes in science, literature, architecture and both mechanical and perspective drawing. The Committee reported that evening classes were 'adequately supplied with teachers and the school-room was well attended by young men anxious to explore the paths of knowledge and to make amends for their neglected education'. These classes were supported by the Department of Science and Art, which provided certification for those who successfully completed the examinations. The Institute was also offering a textile class for 20 young women. There were 28 students attending the French and German classes, seen as vital for those involved in exporting goods to Europe. In total, there were 345 members attending classes in elementary and advanced subjects (Yorkshire Union of Mechanics' Institutes, 1849).

In the same year, building and construction classes were introduced and attracted students who were apprentices and journeymen from the local building trades. The Committee remarked that it appreciated 'the co-operation of the master builders in the town and that the science and art subjects are taught by authorised masters, assisted by a foreman builder, who gives lessons in practical work'. It was hoped that subjects in other trades could be introduced in the same way (Yorkshire Union of Mechanics' Institutes, 1849). By 1851, a specialist

Table 1 Subjects offered at Keighley Mechanics' Institute and class size in 1845

| <i>Subject</i> | <i>Number in Class</i> |
|------------------------|------------------------|
| Drawing | 15 |
| Writing and Arithmetic | 60 |
| Geography | 30 |
| Grammar | 15 |

Yorkshire Union of Mechanics' Institutes, 1845.

drawing class had been introduced for men who were training to become masons, joiners or mechanics (Yorkshire Union of Mechanics' Institutes, 1851).

A similar pattern of curriculum changes was also happening at other Yorkshire Union mechanics' institutes. Having opened in 1825 and closed in 1826 through lack of interest in the sciences from the working classes, the Huddersfield Mechanics' Institute re-opened in 1840 and by 1843 it was offering classes in pneumatics, natural philosophy, reading, writing, arithmetic, geography, grammar, French and drawing. Several subjects were also offered at elementary level (Yorkshire Union of Mechanics' Institutes, 1843). As a result, there was a substantial increase in attendees, of whom 'nearly the whole of the members are operatives in the receipt of weekly wages', which supports the argument that the Institute was offering relevant subjects to the working class. The Committee stated that 'the attendance is great, the average being 180 to 200 every evening' (Yorkshire Union of Mechanics' Institutes, 1844).

The Huddersfield Mechanics' Institute Committee made the strategic decision to concentrate on elementary education, knowing that the vast majority of members had had little or no previous schooling:

The founders and supporters of this Institution, while providing for the intellectual wants of the adult, have steadily kept in view the importance of educational training. Their attention has therefore been particularly directed to the efficiency of the classes for elementary instruction (Yorkshire Union of Mechanics' Institutes, 1845).

All classes were 'arranged according to progress' and all members had to first attend the probationary classes before moving up (Yorkshire Union of Mechanics' Institutes, 1845). Having closed due to lack of interest from the working classes, the Institute did not want to fail a second time.

By offering elementary education and progression onto higher-level subjects, many larger Yorkshire Union institutes were in a strong position to establish government Schools of Design, such as those at Bradford, Huddersfield, Keighley and Leeds. The School of Design at Huddersfield, opened in 1846, offered ornamental, architectural and mechanical drawing classes, all of which were 'popular and the standard of work high' (Yorkshire Union of Mechanics' Institutes, 1846).

Frederic Schwann, President of the Huddersfield Institute, encouraged the teaching of design and practical chemistry classes after its re-opening in 1840. He stated that 'the importance of the chemistry class cannot be overlooked in the neighbourhood, when we consider how inferior our fabrics are in beauty of dye and colour, to those of our competitors' (*Huddersfield Examiner*, 1882). By 1846, the School of Science offered chemistry classes with an emphasis on practical laboratory sessions supporting the local dye industries. It was stated that the main objectives 'are so important to so many useful arts in life and its aids being necessary in almost every process of agriculture and manufacture, in the operations of bleaching, dyeing, and printing' (Yorkshire Union of Mechanics' Institutes, 1846).

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Members themselves were keen to gain knowledge and recognition for their learning and were motivated to attend the Huddersfield Institute, some travelling several miles. Amos Booth, who was to receive a prize in the Society of Arts examination in drawing in 1857, walked five miles from his home in Kirkburton to Huddersfield, as did Alfred Walker who came from Rastrick, some four miles away, 'after finishing his work in the mill' (*Journal of the Society of Arts*, 1858).

The School of Design at Keighley was offering classes in the practical study of design and drawing by 1849, for 'those students who are engaged in the fancy manufactures of the district and to those who are connected with ornamental trades and mechanics'. The mechanical drawing class was delivered through the school and students 'acquired considerable skill in drawing, and a good knowledge of the mechanical operations of steam, the [mechanical] movements of locomotives and other engines'. The Committee highlighted that these classes helped to 'greatly improve their [members'] arithmetical and commensurate knowledge' (Yorkshire Union of Mechanics' Institutes, 1849).

The Institute also identified the importance of developing skills of its members through the classes and curriculum being offered:

in a manufacturing community like this, where much ingenuity is required to invent new patterns, it is exceedingly desirable to elicit and cultivate native talent, in order that successful competition may be carried on with surrounding towns in the worsted manufactories (Yorkshire Union of Mechanics' Institutes, 1849).

This observation by the Committee was being made some two years before the Great Exhibition of 1851, when the British Government would be alarmed at the rapid industrial developments taking place in Europe and in other parts of the world. It highlights how mechanics' institutes had already begun to recognise the importance of relevant curricula being offered to the working-class memberships, employed by manufacturers who in turn benefited from their workers receiving elementary and technical education.

Meanwhile, by 1850, the profile of those who attended the mechanical and architectural drawing classes at Huddersfield included 'mechanics, operatives, workers in brass and iron, builders, joiners, cabinet makers, carvers, gilders and painters'. Students of ornamental drawing had become competent in cloth designs and colour, no doubt relying on the knowledge and developments in the dye industry supported by the Institute's chemical classes (Yorkshire Union of Mechanics' Institutes, 1850).

The Committee made specific mention of the fact that chemistry was of 'great importance to manufacturers and to the arts of bleaching and dyeing' rendering the class 'a real and solid acquisition to the Institution'. The lessons were of a practical nature and students were expected to carry out their own experiments. Huddersfield was not the only institute offering courses that specifically supported the textile industry. Almost all towns and settlements that had a mechanics' institute in the West Riding, and indeed some in the North and East

Ridings of Yorkshire, offered similar subjects which supported the needs of their local industry (Yorkshire Union of Mechanics' Institutes, 1851).

The development of the curriculum also benefited working-class females, who were encouraged to attend mechanics' institutes in similar ways to men. The Committee of the separate Huddersfield Female Institute, for example, reported in 1854 that it had been founded 'to afford to young females of this town and neighbourhood additional opportunities of mental improvement, by means of evening classes, a library, lectures, &c' (Yorkshire Union of Mechanics' Institutes, 1854). The main purpose of the Institute was in providing elementary classes in 'reading, writing, arithmetic, geography, history, and other branches of a sound moral and secular education' (Yorkshire Union of Mechanics' Institutes, 1854). By 1858, there were 41 classes of which 31 offered elementary subjects to 403 students (see Table 2 below).

In 1858, 'a class for the improvement of the older pupils in sewing and plain dressing' was established and the Committee canvassed local manufacturers for support, stressing the importance of having an educated female workforce in response to the technical developments in industry (Huddersfield Female Education Institute, 1858).

Other institutes responding to the need to offer elementary science education included Darlington Mechanics' Institute which, in 1855, organised 14 lectures that were delivered specifically to the working-class membership including one on *Chemistry and the Manufacture of Iron* and another on *Gas, its History and Manufacture* (Yorkshire Union of Mechanics' Institutes, 1855). This was the same Institute that had alienated working-class membership with its high-level scientific lectures only some seven years earlier.

Table 2 Number of classes and students on roll at the Huddersfield Female Education Institute in 1858

| <i>Number of Classes</i> | <i>Subject</i> | <i>Number on Register</i> |
|--------------------------|-------------------|---------------------------|
| 6 | Reading | 75 |
| 13 | Writing | 115 |
| 6 | Arithmetic | 90 |
| 3 | Grammar | 52 |
| 2 | Dictation | 50 |
| 1 | Composition | 21 |
| 3 | History | 56 |
| 4 | Geography | 72 |
| 1 | Singing | 34 |
| 2 | Sewing | 40 |
| Total 41 | Total 10 subjects | Total 605 |

Huddersfield Female Education Institute, 1858.

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Institutes responded according to the needs of their members. Whitby Institute, for example, offered general subjects at elementary level in reading, writing and arithmetic as well as drawing and chemistry classes. In 1856, the Committee also introduced a navigation class which was established 'to enable young seamen to qualify for examination at the Marine Board' in London (Browne, 1946).

The responsiveness of mechanics' institutes in providing elementary education as a basis for further advanced studies was also supported by government. *The Newcastle Report* of 1858–1861 emphasised the need for 'the extension of sound and cheap elementary instruction to all classes of the people', stressing the need for adults, as well as children, to have the opportunity to attend an educational establishment (McCord, 1991). This was some 10 years before the passing of the 1870 Education Act. In 1864 the 'Report of Her Majesty's Commissioners appointed to Inquire into the Revenues and Management of certain Colleges and Schools, and the Studies Pursued and Instruction given therein' was published and emphasised the importance of educational establishments offering mathematics, at least one modern language, natural science and either drawing or music alongside the more traditional subjects of classical languages and literature. Mechanics' institutes had by the 1860s responded to the need to offer elementary education and advanced courses in mathematics, geometrical drawing, French and German, both in support of trade exports, and science, particularly chemistry and physics. Thus, they were ahead of government thinking in relation to offering such courses (McCord, 1991).

To further emphasise the opportunities mechanics' institutes offered the working classes, at the Marske Mechanics' Institute on the north-east coast, for example, the Committee had identified in 1866 that the boys who worked in the ironstone mines were unable to be entered for advanced examinations through lack of education. They were required to complete reading, writing and arithmetic at elementary level before moving on to advanced subjects that were offered at the Institute (Yorkshire Union of Mechanics' Institutes, 1866).

Other organisations had also seen the need to offer elementary education, and the potential of doing so, and this had often resulted in local competition. The Institute Committee at Guisborough, for example, reported in 1866 that it had been unsuccessful in establishing classes, particularly in reading, writing and arithmetic. This was because several night schools in the town were offering similar subjects. However, it had introduced a chemistry class which was well attended and was recognised by the Department of Science and Art, indicating perhaps that those from other local establishments progressed to higher studies at the Institute. The government provided £3 for scientific apparatus, in recognition of the success of offering this particular subject (Yorkshire Union of Mechanics' Institutes, 1866).

It was rather fitting that W. E. Forster, Member of Parliament and the Minister responsible for drawing up the 1870 Education Act, which allowed the establishment of local school boards to support free elementary education for all, was a supporter of the mechanics' institute movement nationally. He was also on

several Yorkshire institute committees, including the one at Bradford, the town where he was elected MP in 1861. Mechanics' institutes continued to offer elementary education for several years after the 1870 Act was passed. With elementary education having been established through the board schools, mechanics' institutes were able to concentrate on supporting advanced study in technical and scientific subjects which were becoming more crucial in supporting industrial Britain.

In 1873, for example, the advanced chemistry class at Huddersfield had 27 students under the supervision of George Jarman, 'the more advanced portion of them having been diligent in laboratory practice'. The subject required practical skills in relation to the dyeing industry and new laboratories had been fitted out the previous year to support the demand for this subject (Yorkshire Union of Mechanics' Institutes, 1873).

In 1881, Jarman introduced a class for the study of the application of chemistry in local industries and as a result of its popularity it was planned to run these particular sessions annually as a summer school, when attendance in the Institute would normally have been at its lowest. As well as keeping members interested, the additional fees charged for attending the class contributed towards the cost of the new laboratories (Yorkshire Union of Mechanics' Institutes, 1882). With the opening of the new Technical School and Mechanics' Institute at Huddersfield in 1884, there was 'a large and complete chemistry laboratory, providing provision for upward of 50 students' as well as 'a lecture theatre for 100 and a separate room for physical science'. The new building also had space for 'the art of dyeing processes as the subject is of such importance in the district and the new building is intended to make the best and most complete provision for the study of dyeing and chemistry' in relation to textiles (*Huddersfield Chronicle*, 1884).

It was not only chemistry classes for dyeing that were supporting the local textile industry. The Huddersfield Committee reported in 1873 to the Yorkshire Union that it hoped more men 'who worked in the staple trade of the town' would attend the loom class, as it was thought it would support the industry and their own skills and expertise. The class was held in 'a large and suitable room and several good hand-loom [had] been provided' (Yorkshire Union of Mechanics' Institutes, 1873). The Huddersfield Design and Weaving School, which was established by 1877, was based on the 'district, whose prosperity so greatly depends on a cultivation of the arts of design', although according to Committee minutes, it had taken 30 years for the manufacturers in the area to really appreciate the Institute's educational contribution in support of their workforce and ultimately their businesses (Yorkshire Union of Mechanics' Institutes, 1877). The development of both weaving and chemistry supported the local economy and workforce and recruitment continued to rise. The Weaving School had, by 1885, at least 35 looms of different styles, both hand and steam powered. The dye-house had been fitted out with 'sufficient dye-baths and working benches for 24 students and the chemistry classes could comfortably hold the 53 students now attending on the various courses being offered in this subject' (Yorkshire

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Union of Mechanics' Institutes, 1885). By 1886, Huddersfield had three distinct schools, technical, science and art, between them offering around 50 subjects. Other institutes, often smaller than Huddersfield, were equipping their buildings with science laboratories, such as the one at Cleckheaton in the West Riding of Yorkshire.

Thus, Yorkshire Union mechanics' institutes, in accordance with their objectives, were establishing a reputation for offering good quality public lectures and elementary and advanced classes. Institutes were ideally situated to offer working-class adults relevant scientific and technical subjects, after they had first received an elementary education. A reciprocal relationship between working-class education and industrial success and competitiveness was established and was reinforced with relevant subjects being offered by the mechanics' institutes.

Responding to foreign competition

The Great Exhibition of 1851 highlighted that Britain was vulnerable to foreign competition and that relevant technical education was required and accessible to the working class. This was seen as an important way of fending off competition from abroad, where European countries were producing quality goods and relying far less on British imports. As early as 1848, the Keighley Mechanics' Institute Committee stated that 'our neighbours on the continent, especially France and Belgium, are fully sensible of the importance of these [technical] schools and French [textile] designs are superior to English ones and fetch more cash in the market' (Yorkshire Union of Mechanics' Institutes, 1848).

Some 16 years after the Exhibition, in 1867, the publication 'On the best means of Promoting Scientific Education in Schools: A Report presented to the General Committee of the British Association for the Advancement of Science' provided evidence of technical education being delivered in universities and schools in Germany and France but not in Britain. The result was a paper entitled 'Technical Education: Copies to Answers from the Chambers of Commerce, 1868'. The report identified that:

every trade in Birmingham ... was being injured by the want of technical education. In the Potteries, foreign workmen were taken on because English workmen were insufficiently educated for the purpose. This resulted in higher production costs which in turn made competing with foreign firms more difficult in relation to dyeing, bleaching, fulling, milling and lace dressing. Knowledge of chemistry is essentially necessary for the carrying on successfully of these trades (Betts, 1991).

The Keighley Institute reported to the Yorkshire Union in 1874, that the Trade School provided 'the daily wants of a district deriving its means of subsistence from a variety of trades, requiring workmen of intelligence and skill', having responded, like other institutes, to the need for elementary and advanced education supporting local industrialisation (Yorkshire Union of Mechanics' Institutes, 1874).

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The Institute also highlighted that the town of Keighley had a reputation for making machinery for the worsted trade, employing 4,000 mechanics and was, in fact, ahead of its German competitors. However, in 1874, only 13 students were attending the School of Art, while in Germany, which had a similar proportion of mechanics, it was compulsory that all apprentices attended a trade school. The 1874 Annual Report concluded that 'in view of the dangers of foreign competition, does not this illustration furnish a striking lesson to the ironworkers, employers and employed of Keighley?' The Institute, like others nationally and regionally, was concerned that without the opportunity to offer technical education Britain would fall behind the rest of Europe, a fear well substantiated (Yorkshire Union of Mechanics' Institutes, 1874).

The Committee at Keighley highlighted the problems associated with the textile industry in the area:

In the manufacture of textile fabrics this country has lost, in some respects, the pre-eminence it formerly held over its continental rivals. This was mainly due to the higher technical skill and more cultivated taste of foreign workmen (Yorkshire Union of Mechanics' Institutes, 1874).

The Committee argued that:

The position lost can only be regained by our manufacturers and workmen surpassing our rivals in the methods of production, which render their productions more acceptable to the public. The Council urge that young men connected with the textile industries should join the Weaving School, so that their faculties of design and manipulation in which they are deficient may be cultivated (Yorkshire Union of Mechanics' Institutes, 1874).

Keighley continued to be concerned with competition from abroad and in its 1880 Report to the Yorkshire Union continued to highlight the importance of offering training and education in textiles: 'this country is not receiving the scientific attention which they [textile industry machine manufacturers] demanded, and that the productions of the looms of England were being equalled, and in some cases excelled, by those of other countries' (Yorkshire Union of Mechanics' Institutes, 1880).

Two Committee members from the Keighley Institute, McLaren and Beaumont, presented a report to the Institute following their visit to Europe. They described the weaving schools in France and Germany and supported the decision taken by other Committee members to form a similar one at Keighley in 1880 (Yorkshire Union of Mechanics' Institutes, 1880).

The newly named Huddersfield Technical School and Mechanics' Institute Committee was also concerned about foreign competition and organised a Fine Art and Industrial Exhibition in 1883. Austin Keen, the Secretary to the Committee, stated that:

it is becoming more apparent that the commercial supremacy of this country, so far as its manufactured products are concerned, is threatened by foreign competition,

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and that efforts must be made to infuse new life into our industries, and to impart sound and systematic technical instruction to the rising generation. It is in recognition of this growing necessity that these schools have been erected (Huddersfield Technical School and Mechanics' Institute, 1883).

Meanwhile, Sir Swire Smith, President of the Keighley Mechanics' Institute, was a local woollen manufacturer and supporter of education. Smith wrote a paper in 1882–1883, entitled 'Night Schools and Technical Education' after he had visited Belgium, France and Germany with a number of colleagues, all of whom had identified that, on the continent, employees had much better technical education than those in Britain and this meant that overseas competition had an adverse effect on the whole country. Smith's paper contributed to the 1884 Report of the Royal Commission on Technical Instruction which was set up to investigate the training given in technical institutions and science teaching from elementary to advanced level. The Report emphasised the importance of local authorities providing first-class technical instruction in a variety of educational establishments, including day schools and mechanics' institutes. All Commission members had experience in manufacturing and supported technical education in one way or another. None of them were from the old political class (Maclure, 1969).

Sir Bernard Samuelson, the Chairman of the Commission, had travelled throughout Europe looking extensively at European technical education. The Committee was concerned that Britain was lagging behind her competitors and felt agree that 'effective labour was the most powerful weapon with which to meet our wants' and it was crucial to do this through technical education Maclure, 1969 (. The findings of the Commission resulted in the passing of the Technical Education Act of 1889, which gave local authorities the power to levy a penny rate in order to provide technical courses, appoint teachers and provide grants to technical schools and mechanics' institutes (Maclure, 1969).

As well as the findings of the Royal Commission, the Department of Science and Art encouraged all institutes in the country to 'keep abreast of continental competitors in science and art' and through their grants scheme encouraged mechanics' institutes to offer relevant subjects to support industry and commerce.

The contribution to curriculum made by the Worshipful Company of Clothworkers

Those mechanics' institutes located in the textile districts of the north were often supported by the Worshipful Company of Clothworkers, referred to herein as the Clothworkers' Company, an organisation with an interest in the development of the curriculum to serve the needs of their members. The importance of the company cannot be overestimated as a major contributor to adult education and support for mechanics' institutes in particular. A number of Yorkshire Union mechanics' institutes were supported with funding for teaching textiles and associated subjects through the Clothworkers' Company, which was anxious that

textile education and training should be made available in order to support the industry in Britain and safeguard from competition from abroad. The result was that the Clothworkers' Company funded the introduction and development of textile courses at several mechanics' institutes which, as successful education establishments for working-class adults, were ideally situated to offer such curricula (Clothworkers' Company, undated).

From 1876, the Clothworkers' Company, in partnership with other City Livery Companies and the Corporation of London, began to develop strong associations with technical education in support of its members. Following a conference in 1877, with the Committees of the Mercers, Drapers and the Clothworkers' Company taking the lead, the Livery Companies and the Corporation of London proposed a national system of technical education (Clothworkers' Company, undated).

This was supported by Sir William Armstrong, industrialist; Sir George Bartley, philanthropist; Major General Sir John Donnelly of the Science and Arts Department and Society of Arts; Sir Douglas Galton, scientist; Professor Thomas Huxley, scientist; and Sir Trueman Wood, senior administrator at the Society of Arts. As a result, the City and Guilds of London Institute for the Advancement of Technical Education was established in 1878. Wood, the newly appointed secretary, steered through the transferring of technical examinations from the Society of Arts to the newly formed City and Guilds of London Institute, with the agreement of the Society (City and Guilds, 1993).

The arrangements with the City and Guilds of London Institute resulted in the Clothworkers' Company funding mechanics' institutes to support both textile education and relevant examinations. The Society of Arts and the Department of Science and Art continued to offer scientific subjects, including chemistry, while the City and Guilds of London Institute examined technical subjects, as listed below, with the number of candidates (Table 3).

Table 3 Qualifications and the number of students taking the City and Guilds of London Institute examinations in 1892

| <i>Qualifications</i> | <i>Number of students</i> |
|-----------------------------|---------------------------|
| Mining | 90 |
| Manufacturing | 358 |
| Engineering | 1221 |
| Electrical Engineering | 689 |
| Machinery | 212 |
| Textiles, Footwear, Leather | 3650 |
| Building and Construction | 1929 |
| Communications | 256 |
| Art Design and Crafts | 29 |

City and Guilds, 1993.

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Although the data provided is for the last decade of the nineteenth century, it does provide ample evidence of the popularity of the textile courses offered in mechanics' institutes, supported with funding from the Clothworkers' Company.

The Clothworkers' Company provided grants to support technical education. Keighley Mechanics' Institute, for example, was provided with a grant of £50 per annum. The money was used to purchase equipment, including hand-loom, to 'fight off overseas competition' (Yorkshire Union of Mechanics' Institutes, 1880). The Weaving School, which was set up to study the 'theoretical and practical study of designing and weaving', was founded for 'those particular subjects, which are more intimately connected with the trades of the district'. These included spinning and weaving of wool, and 'the construction of the special description of machinery required for these processes' (Yorkshire Union of Mechanics' Institutes, 1880).

It was possible for former mechanics' institute students to progress to even higher levels of textile courses. The Yorkshire College of Science, later to become part of Leeds University, had been established in 1869 but was struggling financially and requested assistance from the Clothworkers' Company. Funding was provided and by 1885 the College was offering various higher-level textile courses as well as dyeing and chemistry classes. Bradford, Huddersfield and Leeds Mechanics' Institutes, as well as others, sent several students every year to attend these classes.

The Clothworkers' Company donated scholarships enabling several students across the Yorkshire Union to continue their studies at the Yorkshire College (Yorkshire Union of Mechanics' Institutes, 1880). In 1881, their examinations held there were attended by six students from Huddersfield (Yorkshire Union of Mechanics' Institutes, 1881). The following year, at Huddersfield, over 50 candidates were entered for the City and Guilds of London Institute examinations in textiles, the results being 'very creditable' (Yorkshire Union of Mechanics' Institutes, 1882).

There is little doubt that the developments in textiles could not have taken place without the support of the Clothmakers' Company:

finding themselves, in consequence of the changes brought by the lapse of centuries, far removed from the great centres of the woollen and worsted trades, nobly resolved to resume their ancient responsibilities by placing their Company at the head of every movement which had for its object the improvement and development of cloth working in all branches and in every locality (Clothworkers' Company, undated).

Mechanics' institutes were able to respond to this, particularly with the financial support made available and which ultimately supported the movement in textile districts until the end of the century (Clothworkers' Company, undated).

Examination boards supporting courses in mechanics' institutes

Various examination boards were responsible for examining qualifications being offered in mechanics' institutes and gave them national credibility as educational

institutions. The Department of Science and Art, for example, gave financial support for mechanics' institutes offering science classes and set examinations, particularly in relation to chemistry. The Department also arranged for lectures to be given in mechanics' institutes free of charge (Yorkshire Union of Mechanics' Institutes, 1862). The Department also provided inspectors to audit the quality of teaching (Yorkshire Union of Mechanics' Institutes, 1865).

In 1866, J. C. Buckmaster from the Department of Science and Art attended the Darlington Institute and addressed members on *Instruction in Science and the aid given by the Department to Science Classes*. He travelled from London specifically to work with the Institute and the result was the introduction of the Department's own science and art examinations for those taking these subjects (Yorkshire Union of Mechanics' Institutes, 1866).

Other mechanics' institutes also benefited from the Department's intervention. The Committee at Brighouse Mechanics' Institute near Halifax reported in 1872 that 26 students had been entered for the Department of Science and Art examinations, which were a comparatively new feature at the Institute and had 'met with a fair amount of success' (Yorkshire Union of Mechanics' Institutes, 1872). The Committee at Lockwood Mechanics' Institute near Huddersfield stated the following year that examinations were held through the Society of Arts and the Department of Science and Art, which were all seen as stimulating study, providing national recognition and a 'fair estimate of the work done by the classes' (Yorkshire Union of Mechanics' Institutes, 1873).

The School of Art at the Huddersfield Mechanics' Institute in 1874 also offered examinations through the Department of Science and Art, which had 'a practical application to the industries of the town and neighbourhood' (Yorkshire Union of Mechanics' Institutes, 1874). Examinations in chemistry included essays set on *Wool Dyeing* and *Cotton Manufacture*, for students attending institutes in the textile districts (Yorkshire Union of Mechanics' Institutes, 1879).

In 1881, Yorkshire Union mining institutes in the north-east were running the City and Guilds of London Institute technical qualifications including those at Crook, Pease's West and Esh, all of which were supporting adult education in the newly developing mining communities (Yorkshire Union of Mechanics' Institutes, 1881). In 1882, the Lingdale Miners' Institute sought approval to run science and art classes through the Department and, in the same year, Skinningrove Miners' Institute not only had a successful inspection carried out by the Department of Science and Art of its classes, but also the examination results were successful in comparison to national results. The Inspector for Skinningrove reported that members 'are carefully taught and the discipline is highly satisfactory' (Yorkshire Union of Mechanics' Institutes, 1882).

The Report of 1885 for Pease's West Mining Institute stated that it had been running the City and Guilds of London Institute course in mine surveying. In that year out of five honours certificates awarded in the subject nationally four were gained by students attending the Institute. At the Skinningrove Miners' Institute, a former student was selected by the Department of Science and Art to attend a

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four-month course of lectures at the Royal School of Mines (Yorkshire Union of Mechanics' Institutes, 1885).

The City and Guilds of London Institute was also involved in setting and managing the examinations in relation to cloth manufacture courses offered at mechanics' institutes in the textile districts (City and Guilds, 1993). A cotton manufacture course was offered at the Hebden Bridge Institute near Halifax in 1882 through the City and Guilds of London Institute, and was taught by a former student. The Committee believed strongly in workers taking up the opportunity to attend and sit the examinations who were: 'in the trades and manufacture of the district [and] to take advantage of the City and Guilds examinations, for the technological certificates which will doubtless become valuable testimonials to them in seeking employment' (Yorkshire Union of Mechanics' Institutes, 1882).

In 1884, Lockwood Institute, near Huddersfield, introduced a technological class for the teaching of cloth manufacture and the students were examined through the City and Guilds of London Institute (Yorkshire Union of Mechanics' Institutes, 1884). The science and practical chemistry classes were well attended at Lindley Institute, also near Huddersfield, in 1873, where students, 'who made good use of the laboratory', had been successful in the May examinations held by the Department of Science and Art (Yorkshire Union of Mechanics' Institutes, 1873).

Thus, external examinations gave academic rigour and external recognition for subjects offered through the mechanics' institutes and, in the case of textiles, the Worshipful Company of Clothmakers provided grants to support individual institutes, and prizes and scholarships for students in order to encourage them to continue their studies and gain higher-level qualifications through the Yorkshire College. The Society of Arts, the Department of Science and Art and the City and Guilds of London Institute were offering technical qualifications throughout Britain. More locally, there was also the Yorkshire Union of Mechanics' Institutes Education Board which continued to offer examinations during the early years of the twentieth century.

Conclusion

Mechanics' institutes were initially ambitious in offering advanced level scientific subjects. However, in the case of the Yorkshire Union at least, their committees realised the enormous potential of establishing elementary education for the working classes, identifying that such knowledge was the foundation on which higher relevant technical education would support industrialisation, as well as contributing to the success of the mechanics' institute movement generally. A variety of subjects were introduced to support advanced level learning and supporting relevant employment in the textile, engineering, agricultural and local trades. In order for this to happen, external income from various authorities, including the Clothworkers' Company, provided funding towards institute

building costs, equipment to support textile education and training and scholarships for attendance on advanced courses. Once external examinations and certificates were available, the subjects offered had more credibility and national recognition. Qualifications were offered through the Department of Science and Art, the Society of Arts and, towards the end of the nineteenth century, the City and Guilds of London Institute. National examinations in subjects offered at mechanics' institutes gave their members more opportunities of employability and gave the movement national recognition in offering courses and qualifications to working-class members that were relevant to industry and technological progress as well as crucial in responding to foreign competition. It was on this firm foundation that twentieth-century technical schools and further education colleges were established and which continue today in offering vocational education and training through awarding organisations including the City and Guilds of London Institute, which is the only one to keep its original title.

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