Vocational Education & Training

Key Considerations when Designing Vocational Models and Curriculums Intended for Under-educated and socially deprived Youth and Adults in Developing Countries

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January 2008

Contents

Introduction & Background:

In the past decades there has been a significant transformation in global fiscal trends from a traditional resource based to a fast moving knowledge and technologically centered market. While this readjustment has triggered a significant number of advantages, issues and consequences upon industrialized countries, it has created even more concerns in emerging nations that are striving to close the economic disparity gap.

Whereas there are numerous difficulties for developing countries to contend with, one of the foremost of these is the fact that they possess a substantial proportion of their populations that are uneducated and deficient in the necessary skills required to help themselves, or to contribute in their country's commercial expansion. It is also conspicuous that the more affluent, who have acquired various levels of schooling, tend to be indifferent to vocational careers, while the uneducated and socially deprived have very few opportunities to improve their social disposition.

In addressing this situation, governments in cooperation with international agencies have been implementing skills orientated programs that are targeting unqualified and underprivileged sections of the community. However, if the aforesaid are to make further in-roads in dealing with this situation they need to consider significant issues and realities that are being experienced in local communities. When investigating these circumstances from a viewpoint that is more attuned to the actually on the ground, it highlights the fact that, there are a number of crucial matters that should be examined in much greater detail.

This review focuses on these matters, and more specifically discusses educational and systemic relationships linking key considerations concerning; 1) cultural dimensions, 2) language and communications, 3) learning styles, 4) gender and equal opportunities 5) appropriateness of courses, 6) supplementary knowledge, 7) accreditation, and 8) teaching and training methodologies. Furthermore, in the concluding section applicable factors that have been extracted from these deliberations are woven into the fabric of an adaptive vocational model in order to illustrate how the threads come together to form an appropriate and inclusive learning tool.

As a final point, this appraisal also provides an addendum containing; a) suggestions for possible resources that government and private businesses may already have and could, if approved, can be incorporated in the course content, b) a list of departments, institutions, community, and commercial environments that can be researched, and c) key questions that need to be asked and more importantly, answered.

Cultures, Societies and Vocational Education:

International organizations and individuals ought to reflect upon important factors concerning socio-cultural diversity and the issues that these inherent conditions can influence in any proposed educational interventions. The aforementioned should not only aim to understand the culture they are attempting to cultivate but must seriously consider their own historical conditioning in order to draw attention to significant concerns that may be acting as obstructions to the realization of a genuinely objective approach.

Appreciation of differentiations, similarities and historical conditioning that are intrinsic to both the transferring and receiving cultures, may well help explicate specific parameters that can be successfully worked within. Furthermore, comprehension of these issues can also act as guides whilst evaluating characteristics that could be pursued beyond their traditional limits, and perhaps,

to facilitate any socio-cultural developments that advocate enhanced dialog through mutual understanding.

Consideration should also be given to the fact that many emerging economies have a diversity of sub-cultures that will need to be investigated from different perspectives. Clearly, this would also infer that in some cases a standard vocational model applied countrywide may not necessarily fit all situations for a number of reasons, but most especially when the sub-cultures have comprehensible disparities. Failure to recognize these conditions, when they do exist, can have significant consequences in accordance with identifiable curricular constituents if they are not premeditated during the initial development of educational intercessions.

Vocational education in developed and industrialized nations has traditionally been categorized as inferior to that of academic forms of learning. This self same culturally conditioned attitude also applies to many emerging countries and particularly within the more privileged and middle classes. Whereas, there are many underlying reasons from educational perspectives as to why the offspring of these groups often do not succeed in attaining vocational skills, it is apparent that many believe it is a form of education somewhat beneath their lifestyle expectations.

Undoubtedly, this state of affairs is creating considerable issues and consequences across the board and is certainly impeding a valuable human resource from contributing to occupational skills sectors. Moreover, and importantly, it is this social group that is more than likely to have access to guidance and financial support when creating any new business ventures.

On the other hand, the underprivileged and educationally disadvantaged youth and adults have very little alternatives but to become menial workers in the informal sectors with little or no prospect of improving their economic condition. Usually they are exposed to all forms of exploitation and have no social security net to support them when they become casualties of the conditions they are obliged to work in. Opportunities for self improvement through educational or skill based training programs are minimal and when they are available they are either/or;

- problems with accessibility,
- too expensive,
- make assumptions regarding the participants levels of knowledge,
- do not usually consider that there are different learning styles,
- lack of advice regarding individuals ability to undertake a chosen course,
- teachers, teaching, trainers and training methods can be and are substandard,
- applying the wrong approach – academically weighted rather than constructivist,
- training courses falling short of being knowledge and vocationally inclusive,
- lack of quality resources,
- have questionable accreditation:

Evidently, when contemplating any educational intervention it is fundamentally important that the participants, either male or female, are given every opportunity to succeed in becoming proficient in an area that is the most appropriate to their own personal temperament. Furthermore, it should be realized that individuals may only have a negligible understanding or exposure to the subject matter.

Curriculums, lesson plans and practical courses must therefore take into account that numerous participants have a significant deficiency in any formal education or vocational abilities, while those who have attended recognized educational establishments can have substantial inadequacies that include;

- form and function,
- problem solving,
- lateral thinking,
- speed, time and distance,
- basic mathematics,
- limited reading and writing capabilities,
- inadequate communications abilities, and
- little or no business acumen:

When targeting the educationally ill-equipped it is much more realistic to consider a model that makes no generalizations or hypothetical assumptions as to the levels of education regarding potential trainees. Almost certainly, any course that is written for this particular target group should assume that all members are equally underdeveloped in order to design and apply foundation level courses which will act as a catchment, and therefore, all novices will have an equal opportunity to participate. [1]

Language & Communications:

Language is a foremost challenge when communicating and should never be underestimated. Both the delivery and reception of information in learning processes must be carefully planned when instructing these particular target groups. Due thought should always be given to appreciating the constraints of local languages and any translations or interpretations that will be required when conveying subject matter. Evidently, this will obligate the recipients to understand specific features associated with any innovative vocabulary.

While English is a foremost language in global economics followed by a number of other Eurocentric styles, it should be noted that these are by and large complex in their composition. Furthermore, technological artifacts, industrial machinery and processes are frequently described and distributed by the same linguistic mediums. Using more complex languages and literal translations in instructional techniques can raise complex difficulties when transferring to developing communities with much more simplistic vernaculars.

In elementary languages there is usually no local name for a new technologies and very limited if any vocabulary to describe the particular artifact, component parts, mechanism or modus operandi in their development. Indeed, when using a word like, “telephone” to describe a communications device in English, it may well take a whole sentence or more in other languages to do the same. While the terminology of an artifact is usually adapted quite easily in one form or another depending on the dialect; describing its inception, production, construction and functions through words alone is not so straightforward and may in some cases prove to be almost unattainable.

Inferences elucidated by this particular disposition clearly promote the utilization of procedures that complement and support learning processes which linguistic disparities clearly impose. Methodologies in vocational disciplines must recognize this particular condition and integrate considerable sensory, emotional and constructivist techniques as is practicable in responding to this verity.

[1] For further discussions see “An Essay in Culture, Society and Vocational Education”, John H Cully, ERIC#ED499042

Learning Styles and Skill Sectors:

According to some theoretical models, individuals process knowledge in different ways, and although they may not be precise these archetypes do have some merit in identifying learning styles. Through determining approaches that are comparative to identifiable requirements for specific skills, it may be possible to refine selection processes that can better recognize qualities inherent to specific trade prerequisites.

Although there are various theories dealing with this matter, in this instance, the Honey & Mumford model will be utilized to illustrate this specific line of thought. The supposition contents that there are four identifiable learning styles, Activist, Reflector, Pragmatists and Theorists. If these individual learning styles combined with specific senses and emotions can be shown to be interrelated to explicit skills, at least in part, then teachers and instructors will have a better idea as to what direction participants should or want to progress.

Even though the Honey & Mumford approach may be debatable from various standpoints, it certainly merits contemplation and further exploration. The following two examples will help to highlight the conjecture.

Example 1: Skill Sector - Welding & Fabrication:

Styles and Senses

- Dominant Learning styles: Activist, Pragmatist. (Combination)
- Activists; like to perform hands-on work and learn better through practical application.
- Pragmatist; prefer seeing how to put things into practice in the real world.
- Dominant senses; hand eye coordination and concentration. (others in this group could include; plastering, painting & decorating but to a lesser extent)

Activities and knowledge:

- An activity approach where practice is the only method of becoming proficient.
- Requires re-practicing if not used for a long time.
- Fabrication requires visualization of the finished product.
- Construction and deconstruction. (Readapting and demolition)
- Knowledge can be either fairly straight forward or extremely complex and technical.
- Requires multiple techniques, multiple amperage settings, multi-positional, diverse electrodes and has many variations depending on metallurgical requirements.
- Materials are many and still being developed.
- Moving forward in some areas but fairly static in others.

Example 2: Skill Sector - Motor Mechanics:

Styles and Senses

- Dominant learning styles: Reflector, Activist. (Combination)
- Reflectors think about what happened.
- Activists prefer hands-on work and learn better through practical application
- Dominant Senses; Sight, sound and smell. (Touch and taste may also be utilized)

Knowledge and activities

- Mechanical and electrical knowledge.
- Construction and deconstruction. (Intrinsic to trade)

- Systems and fault analysis
- Unit changing.
- Broad diversity of models. (Becoming more sophisticated)
- Still developing more complex systems. (Computerized management)

Clearly, and given that this may be the case in many instances, it is therefore preferable to make an attempt at identifying which learning technique best suits particular skills sectors as it can help when guiding trainees before they actually chose a vocational program. However, this should not exclude a trainee's desire to learn a skill irrespective of perceived learning styles.

Appropriateness of Vocational Courses:

While it is a worthwhile exercise to explore and identifying the suitability of a trade skill for individual learners, it is certainly essential to recognize the correct subject matter for any course program. This might not be just as easy as some might suppose, for the simple reason that when applying a generalized or hypothetical assumption to any intervention, relying upon this premise alone can be misleading.

Take for instance; at the planning and strategizing level it is assumed that there is a need for automotive mechanics or welders, then the course developers need to seriously consider what is the most practical for a particular location, and moreover, what can the target group actually have access to, either at that current time or in the future? If they fail to do so, then incorrectly targeted courses may have negative consequences.

Consider the following scenarios;

A) With the best of intentions an automotive fault analysis training course has been set-up in a particular locality, however, the precept of international, national or organizational policies, rules and guidelines are at odds with reality as experienced at implementation levels.

General course overview:

- The target group is youth and adults who are educationally and socially deprived.
- The course is six weeks long.
- Trainees learn how to analyze general mechanical and electrical faults and repair them.
- The expectation is that they will set up small business ventures.

However, there are a number of issues that were not considered in the first instance, including;

- Was the course appropriate given that a high percentage of private transport is via motorcycle, as is the case in many developing countries?
- Did the course only include fault analysis that can be detected in a workshop and has not allowed for the fact that there are many defects that can only be identified and confirmed when driving the vehicle?
- Given the target groups status, do they have a license for an automobile or can they drive?
- Was there a consideration regarding the cost of spare parts as these can be very expensive, and indeed, some of the profits are from buying replacements at reduced rates?
- Was it considered that motorcycles were a more appropriate option and that access would have been less demanding for this particular group?
- Was there enough time allowed to learn and become skilled realistic?

B) Scenario B is set-up under the same conditions as that of A.

- The target group is youth and adults who are educationally and socially deprived.
- The course is six weeks long.
- Trainees learn how to electric weld mild steel plate in multiple positions.
- The expectation is that they will set up small business ventures.

In a similar fashion there are a number of matters that were not given enough thought, including;

- Knowing how to weld is not enough on its own as trainees may need to be knowledgeable in metal fabrication.
- Did trainees receive enough information when considering the expectations of those designing the curriculum?
- Was this the most appropriate course given that this form of steel work is specialized, expensive and needs heavy duty equipment to manipulate it?
- Was there enough time allowed to learn and become skilled realistic?
- Would it not have been more appropriate to have taught trainees to weld lighter metals like thin plate, pipe and bars that are much cheaper and can be fabricated into more simple products?

Evidently, there are key issues when designing courses as the preceding examples clearly show and highlight the fact that, not only do trainees require basic skills, but also need other relevant knowledge together with realistic options when it comes to having access to markets that are more applicable to their social disposition.

Gender and Equal Opportunities:

Gender imbalance is an exceedingly conspicuous and contentious issue in vocational education as it has been traditionally and historically pre-disposed to facilitate the male population. Percentages of female involvement can be abysmally low and there is often no genuine attempt being made to encourage women into this educational mainstream. As always, when evaluating this particular issue, “caution” is the key word, irrespective of any policy guidelines or agendas. Advocating gender and employment parity in theoretical terms may seem plausible, but the reality on the ground can be quite another. Designing courses inclusive to both genders will necessitate deliberations from a number of perspectives and will certainly require analysis;

- What for instance are; national, regional, sub-regional, communal, political, ethnic, religious, class/caste, commercial interests and trades unions’ attitudes and concerns regarding gender issues?
- Is there a perceptible difference between the stated and actual attitudes and concerns?
- What has been the cultural, traditional and historical position?
- Has the wearing of cultural, traditional or religious garments or accessories been allowed for, and is there any potential concerns or conflicts related to any trade sectors.
- Is there a potential for sexual harassment?
- Is there a possibility of alienation or hostility?
- Can any attitudes, concerns, traditional and historical factors be mitigated?
- Has there been any previous gender related initiatives, and if there were, what was the result and what agency initiated it?
- Have there been any noticeable trends and are they location specific?

- Are there more suitable skills sectors for women given the socio-cultural mind-set?
- Has any businesses taken on female staff in new skills sectors?
- Has any businesses taken on women to do traditional male employment?
- Would potential employers be willing to take on women in traditional male roles or new skills sectors?
- If there has been females employed, are they being paid the same as their male counterparts?
- Do the training and employment premises have facilities for female staff?
- Do any of the training establishments have facilities for physically challenged participants?
- Have there been any allowances made for female related issues?
- If training were made available to female participants, would it be viable in the short or longer term to do so if there was a strong possibility that there would be resistance to employ them irrespective of policy or agendas?

Gender and equal opportunities will continue to be litigious issues and by their nature must be dealt with in an extremely sensitive manner. Promoting an external agenda may not always be the best way forward in some situations as this can cause both surface and subliminal tensions. It would also be prudent to bear in mind that there are situations where interventions of this type are challenging thousands of years of history and tradition and will not change so easily just because external agendas infer they should. Clearly, this is not an easy mindset to overcome and may need much more time to filter into some of the societies that organizations are working within. In countries where the intervention is seen to be working, then lessons can be learned, but they may not always be applicable to other cultural conditions.

Important Supplementary Knowledge:

Given the difficulties demonstrated by cultural dimensions, educational deficiencies, complexities instinctive to diverse dialects, the appropriateness of course content and gender issues; curriculum designers, managers, teachers, trainers and instructors, are out of necessity, compelled to use procedures that will provide the participants with a broad range of possibilities to learn and attain genuine abilities. Moreover, if the intention is also to impart business capabilities then these factors must be interlaced within appropriate elements of the model.

When designing curriculums inclusion of the subsequent supplementary criterion should certainly be taken into account;

Health & Safety:

As Health and Safety is a major issue in developing countries this topic has to be reinforced at every level. Trainees will need to be well versed in general and trade specific concerns, and furthermore, should also be encouraged to disseminate best practice whenever they come into contact with less than favorable conditions. Not only should trainees be taught to have a healthy respect for trade related materials and utilities, but also be aware that there needs to be a balance between reverence and trepidation, especially when using electricity, machinery and chemicals. Furthermore, it would be practical and judicious to include basic First Aid as there is very few opportunities to be taught this particularly important subject.

Construction and Deconstruction:

It is often the case that many institutions teach construction, but with the exceptions of a few trades, very rarely discuss deconstruction. This should be considered as a very important issue as it is

related to the alternative use of materials, recycling component parts, and notably, health and safety issues. This is particularly important in the building of larger scale constructions as these are often deconstructed, demolished or readapted.

Tributary learning:

Tributary learning, for the want of a better description, is a complementary learning element that can be developed in order to inform trainees about relative background knowledge that is vital to a more in-depth understanding of a particular skill. Undoubtedly, this will support the main objective by enhancing the abilities beyond the original intention. These tributaries could be included during formal working hours by weaving them into the course work or alternatively during the trainees free time. A combination of both could also be employed, however, there is a need to be aware that some participants may have family or work related responsibilities during these periods.

Tricks of the trade and alternatives tools and equipment:

Another form of knowledge that can be imparted is better known as "*tricks of the trade*." These noteworthy facets, some of which can be essential traits in many trades, are not normally written in any technical manuals but retained as surreptitious records in the tradesman's mental library. Historically, they remained concealed from the novice and were not revealed until after the apprenticeship had been indentured, and in some cases even longer. However, in more recent times their importance has been superseded by new technologies which have made numerous of them obsolete. Nonetheless, many instances still remain and can be exceedingly beneficial additions when conveying expertise.

Some of these are;

- Certain types of wood will split if a nail is driven directly into it, however, if the point of the nail is blunted it will not be so easy to split this timber.
- Tapping a brush against the inside walls of the paint pot will help prevent the liquid from dripping.
- Wrapping the earth cable around a steel pipe to avoid magnetic arc pull in electric welding.
- Wetting hardboard before applying it to a wooden frame renders a smooth flat finish when it shrinks after drying out.
- Heat treating the convex side of mild steel to straighten distortions caused by welding.
- Filling a pipe with sand before bending helps to produce a smoother and rounder curvature.

In addition to "*tricks of the trade",* instructors should illustrate and incorporate alternative ways to make equipment that are usually too expensive for beginners. There are many books, manuals and information on the internet on this subject and furthermore, some of these could be included as projects during the course.

Note: With an increasing awareness of environmental concerns, courses must encourage participants to look at the reusability of what is normally considered as being disposables.

Basic business Acumen:

If, or when a course includes a form of business related activities or expectations, the presumption should be that trainees have had no formal exposure to the world of commerce. When this is the case, it is therefore imperative that trainees are equipped with the necessary knowledge to help them understand the difference between making a profit and that of a loss.

Theoretically, and through explicate activities, trainees will need to be taught how to make a business plan and price a product to be manufactured, a service operation or any type of works that will be undertaken. Key activities and questions must include;

- Making a full assessment, writing notes and list all requirements including drawings and measurements and then ask the following questions;
    - Is there any possibility of appraising a similar activity?
    - Is there any guarantee that remuneration will be forthcoming?
    - Are there any health and safety issues?
    - Are tools and equipment required, and if so, how much will they cost to buy or hire?
    - How much will utilities like electricity or water cost?
    - How much will telephone communications cost?
    - What price are the materials and any consumables?
    - Is there a need to hire space?
    - What time factors are involved; hours, days, weeks, months?
    - What are the labor costs?
    - Will there be any working periods outside of normal times?
    - Is there travelling involved and how much does it cost?
    - Will the commodity need transportation?
    - Ensuring that there is an allowance for unforeseen eventualities?
    - After totaling up all the overheads, is it a viable undertaking?
    - How much profit is there involved?

Although this general outline is fairly basic it illustrates how to work through a logical system and why there is a need to think about overheads and practicalities before undertaking small business ventures. Making simple mistakes can be the difference between turning a profit and accepting a loss with all of the consequences that it entails.

There may also be a need for support mechanisms for trainees who have the astuteness to identify possible niches or create their own. From a business and development point of view this could be achieved by utilizing a venture workshop attached to the training center, while it would also be judicious to set-up enterprise zones by local government to stimulate and nurture potential and local initiatives.

Accreditation:

Accreditation must reflect the actual abilities of the trainees as any award that is issued as a blanket achievement is wide open to speculation. In many instances, it does not indicate the degree to which each participant has attained a specific level of competency in accordance with the individual attributes that constitute the overall programme. In the long run this can be disappointing as the net effect of not being able to live up to the presupposed standards these awards imply, can only have a negative impact for all of those involved. When the accreditation becomes more important than the actual component parts there is a serious need to reflect on what needs to be amended in order to remedy these circumstances.

Surely there is an onus on any training facility to guarantee that they generate quality trainees and their accreditations must be realistic and achievable. Every trade and skills sector will contain specific practical elements and these are usually supported by subsections and knowledge. However, other facets will also have to be considered, and these may not be directly related to the skills and

information requirements, but must be taken into consideration as they have obvious associations with an inclusive learning process.

Grading categories can include;

Skills and knowledge related categories:

- Health and Safety
- Practical abilities in major sections.
- Practical abilities in subsections.
- Practical project work as applicable.
- Theoretical classroom work.
- Theoretical and practical Tributaries.
- Conceptualization and problem solving.
- Basic business theory.

Associated categories:

- Attendance.
- Attitude and enthusiasm.

The percentage of grades allocated to each category must reflect the importance of each, and furthermore, must eliminate as much subjectivity as is reasonable. Simplicity and accuracy in marking is a key feature as an overly complicated methodology can cause confusion and overload the system with unnecessary bureaucracy.

Teaching and Training Techniques:

Communications, Teaching and Training Methodologies in the Classroom:

While designers are required to produce high quality vocational models and curriculums, the delivery and outcomes will unquestionably be relative to the capability of the teachers and trainers that are dispensing the subject matter. The ability to teach and train participants from the target group indicated, demands in-depth sector knowledge, practical prowess and a broad understanding of the associated concerns and issues that are fundamental to an inclusive learning model.

In numerous developing countries, identifying existing teachers or trainers that have all of the desirable attributes necessary in the application of this particular division of education can be problematic. When this is the situation there is an apparent necessity for quality teaching and training programs if the desired outcomes are to be realized.

Communicating vocational knowledge in a classroom or similar teaching situations must on no account be merely a matter of the teacher, trainer or instructor simply orating information from documents, manuals, whiteboards and the projected images of words, whilst recipients inertly listen and take notes. It should be remembered that many of the recipients may not be able to read, write, have language related difficulties and could be experiencing problems embracing information by means of these formats.

Evidently, the situation dictates that more Interactive methodologies should be employed to complement and support the practical aspects being carried out in a workshop environment. Utilization and proper application of the ensuing subject matter should be seriously considered for the benefit of the recipients.

Important first impressions and key information:

- General Introduction by teacher/trainer and what his/her overall intention is.
- Each recipient states who they are and what they want to achieve.
- Explain that all participants are working as a team with the same goal.
- Know as much about each trainee as is appropriate.
- Explain what your expectations are.
- Explain the purpose of the course.
- Explain the course and lesson plans including how individual strands come together and why it has been laid out in that form.
- Ensure that the accreditation system is described and understood.
- Ensure that the classroom environment is learning friendly.

Lesson introduction:

- From the beginning, use plain words and illustrations.
- Explain the part that trainees will play during the lesson. (Individual, group and any interactivities)
- Inform them that they will be asked questions during the lesson to ensure that they fully understand what is being communicated.
- Explain the pertinence of the lesson in relation to workshop activities, as well as, where it plays its part in the outside world and in business applications.
- Explain any other pertinent subject matter like; tributary learning, any relevant tricks of the trade and how the business elements will be woven into the course.

Lesson format:

- Communicate distinctly, accurately and in detail.
- Use uncomplicated language.
- If translations are required make sure they are accurate.
- Explain the lesson plan.
- Explain what the word aim actually means.
- Explain what the word objective actually means.
- Explain aims and objectives.

Lesson tools and key elements:

- Incorporate pictures, drawings and videos, while at the same time talking trainees through them.
- When employing theoretical models use real life examples or activities.
- Simplify, emphasize and reinforce key words and ideas.
- Use colors, symbols, sounds, smells, and tastes but be careful of the cultural meanings associated with colors and symbols.
- Ensure that illustrative handouts are made available.
- Use as much interaction as possible.
- Encourage questions.
- Encourage being asked to repeat explanations when topics are not fully understood.
- Encourage group cooperation and interaction.

- Encourage trainees to gain social skills and leadership qualities.
- Inspire confidence by using the right words.
- If at any time there is a need to give negative feedback, never leave the individual/s with a feeling of despondency, but highlight something that was positive in the person/s earlier work as your final words.
- Instill gender and equal opportunities were possible and appropriate.
- Ensure that trainees stay interested and alert.
- Make sure that participants receive information that can be collected in a file for their future reference.
- Ensure that any practical test pieces are graded and kept in a safe place.
- Ensure that any work carried out beyond the formal hours is checked, recorded and positive feedback given.
- Treat all trainees equally.
- In some cases it may be necessary to help build trainees self-esteem.

Informal interactions and experiences:

Encourage and/or organize;

- Trips to see factories, workshops, garages and businesses. (Choose good and bad examples)
- Observations and studying of products or services being used in real life situations.
- Conversations with artisans and business people in their chosen skills sector.
- Identification of possible business opportunities and research them.
- Consider alternative ways to make tools and products.
- Design or conceptualize new products and/or reinventing old ones.

Communications, Teaching and Training Methodologies in the Workshop:

Without question, working locations can be a hazardous environment and is the place where theoretical health and safety concerns may have to respond to very real consequences. For this reason it is crucial that all aspects are reiterated, underpinned and if necessary reminded about on a daily basis. Trainees must also be made very aware of what to do in an emergency situation.

As learning practical skills involves many trade sectors there will always be a diversification in the procedures related to the subject matter, however, in most cases there are common themes that are followed. While these remain fairly standard methodologies they should be complimented and supported by other applicable knowledge. Trainees must be well versed in basic skills and these should be reinforced by means of supporting tools and a sound knowledge if they are to be given any real prospect in taking advantage of their chosen vocation. This is particularly important if they are expected to become self employed or to open small business outlets.

The following points should be considered as advantageous components that can be woven into the fabric of the program, however, this will depend on the course content, trade, materials and tools being used and if business competences are a part thereof.

Introductory lessons in the workshop:

- **Explain, illustrate and involve trainees in all general health and safety rules, guidelines, use of equipment, emergency procedures and first aid.** (Label all items as applicable)

- **Ensure awareness of;**

- Layout of workshops.
- Emergency escape routes.
- Muster points.
- Fire extinguishers and blankets.
- First Aid boxes.
- Emergency machine stops.
- Any dangerous chemicals, fire-hazards and machinery.
- Sector related hazards and dangers.

Ensure that key facets are highlighted, color coded and where appropriate culturally sensitive. When required, distribute illustrative information and permit hands-on actions. Explain the dangers associated with any misconduct and any serious consequences that may follow in relation health, safety and personal penalties.

Explain health and safety and cost related issues when setting up a small business and if there are any insurance related factors. This will help to reinforce their learning and will be a start to understanding of costs and other factors related to business creation.

- **Explain, illustrate and involve trainees in identifying and using power tools or equipment that will be employed for the duration of the course.**

  Provide illustrative handouts of tools, naming them in appropriate languages, average cost of each piece of equipment and any quality related issues.

- **Explain, illustrate and involve trainees in identifying and using hand tools.**

  Provide illustrative handouts of tools, naming them in appropriate languages and average costs. Where appropriate fix them to a wallboard and mark them accordingly.

- **Explain, illustrate and involve trainees in identifying materials that will be used during the course.**

  When showing materials, fixtures and fittings allow trainees to handle them and explain distinct sense relate features, any similarities and differences in relation to comparable resources, various qualities, best applications in diverse situations and costs. Again if possible and appropriate use a wallboard to mark and price them. (Update as required)

Course elements:

Explain, illustrate, instruct and aid trainees;

- **to carry out basic trade sector skills,**
- **to progressively understand and perform more complex and demanding practical components,**
- **to comprehend tributary knowledge that is applicable to their particular skill,**
- **understand tricks of the trade and consider different ways to make appropriate equipment,**
- **to understand basic business acumen and identify possible markets or employment:**

Apply any other senses that may be applicable to the element. For instance; if the instruction is on how to change oils and to check other automotive fluids, then the trainees should be shown the

differences in colors, smells and texture of the different types. Each and every element must progress through a logical sequence with each one building upon the previous.

In order to assist in outlining and demonstrating all of the preceding assertions the following model will highlight essential threads woven into the fabric of the course following a rational progression.

Model designed for a Short Term Welding & Fabrication Course:

Overview of the Model:

Like numerous other models this one relies on basic assumptions including; that there is adequate funding, good working conditions, appropriate timelines and resources readily available. Furthermore, due to the very nature and expansive subject matter in VET it will deal with only one skills area, but will cite others to highlight differences or similarities where appropriate. The subject matter in this particular case is, Electric Arc-Welding and Fabrication with a limited time scale but could be adapted and applied to many other skill sectors.

Skills sector Electric Arc-Welding?

In many developing countries there is an assumption that, if you train people to weld then they can build upon this skill in one way or another, this can be a misconception, as welding is much more complex than that. To become skilled in welding is very different than becoming proficient in motor mechanics. For instance, consider the following list of key trade elements;

- Welding is a complex knowledge, technique and hand-eye coordination skill.
- This skill requires continuous on the job application or the operator can lose his/her touch over-time (technique, hand-eye coordination) and will require what is known in the trade as getting their "*hand back in again*" – which basically means practicing before attaining the required standard. The longer the time that operatives are not employed in this skill and the higher the standards for particular jobs, the more practice they need to return to proficiency. When trainees are learning to weld on short courses this is particularly important as they will lose some knowledge and certainly lose the techniques along with hand-eye coordination over a very short period of time if they are not in stable working environment.
- There are four popular types of welding all of which demand differing forms of knowledge and techniques; Oxy-acetylene, Electric Arc, Metal Inert Gas (Co2 and Argon) (MIG) and Tungsten Inert Gas (TIG)
- Many other forms of welding exist in different industrial sectors like submerged arc, spot welding, and various forms of shielded arc for using underwater etc.
- Each welding position; down-hand, vertical, horizontal vertical, horizontal and overhead require different techniques, electrode and amperage settings depending on the job requirements.
- Every joint; lap, butt, v-butt, j-butt, T fillet welds, open corner and variations have different techniques which are relative to the aforementioned positions.
- Many countries demand Standards like ASME9G6, BS coding and other ISO specifications before a welder is allowed to work on specific products. (Oil pipelines- nuclear power stations etc.)

- Metals of various types have diverse properties and require specific procedures, welding electrodes or treatment i.e. cast iron, aluminum, stainless steel, manganese steel, armor plate, cortain steel etc.
- Identification of various metals before welding is fundamentally important because while they may look similar i.e. mild steel & cast steel they may require specialist electrodes containing the properties of both metals.
- Fabrication and manipulation of metals requires many additional skills.

When reflecting upon the aforementioned it is clear that welding is a much more complex trade than some might suppose and for this reason any considerations when implementing this type of course, especially in a developmental context, has to be logically thought out. Just knowing how to weld is not sufficient on its own unless there is a production factory/workshop to absorb trainees as they pass out of basic training, and moreover, these same places are willing to show them their on the job welding or fabrication requirements. It is a questionable exercise to teach trainees welding if they are unable to fabricate and manipulate metals to manufacture products, especially if they are expected to become self-employed.

The Model considers;

A. That individual human senses and emotions play an important part in the VET learning process.
   a. Hearing.
   b. Seeing.
   c. Touching.
   d. Smelling.
   e. Taste.
   f. Hand to eye coordination.
   g. Emotional elements.

B. That there is key connections between;
   a. The quality and correct targeting of VET models.
   b. Teaching methodologies.
   c. Teaching qualities.
   d. The learning environment/s.
   e. Enthusiasm and desire to learn a skill.
   f. Individual learning capacity.
   g. Individual learning styles.
   h. Human senses and emotions
   i. Extent to which different senses and emotions are utilized by various skills.
   j. Gender and equal opportunities.
   k. Social and economic disposition.
   l. Employability, confidence building, satisfaction, job seeking and creation.
   m. Post training support.
   n. Making a living that enhances self esteem and improves socio-economic conditions.
   o. Decent working conditions.
   p. Acceptable income levels.

C. Accreditation is based on;

Skills and knowledge related categories:
- Health and Safety *(Including inadvertent)*
- Practical abilities in major sections.

- Practical abilities in subsections.
- Practical project work as applicable.
- Theoretical classroom work.
- Theoretical and practical Tributaries.
- Conceptualization and problem solving.
- Basic business theory.

Associated categories:

- Attendance.
- Attitude and enthusiasm.

Key Elements woven into the course are;

1. Health & Safety.
2. Learning styles.
3. Human sensory perceptions and emotions.
4. Teaching methods utilizing as many senses as is possible.
5. Knowledge of tools, equipment and materials.
6. Welding techniques.
7. Fabrication techniques
8. Measurement and job related mathematics.
9. Technical drawing.
10. Tributary learning to help with critical elements undeveloped from the trainees' early education or complete lack of it.
11. Basic knowledge of small business through producing products.

Assumptions related to this course include;

- It is an introduction to Welding & Fabrication.
- It is of 30 days duration.
- Workshop and classroom attendance is 30 days.
- Overall learning process includes Tributary components and this will extend the overall knowledge accumulation during weekends and after training hours if applicable.
- There are no distinctions made between genders.
- The training environment is gender and social disposition friendly.
- Trainees are guided by the instructor and participants help each other.
- Trainees will have opportunities to see outside workshop/s in actual working conditions.
- Trainees will compile a folder for retaining subject knowledge so that by the end of the course it will be completed and they will take it home for future reference.
- Trainees will be encouraged to search out relevant information regarding their skills area from libraries, book shops, discussions with artisans etc.
- By the end of the course trainees will be able to weld and fabricate basic product/s.
- *That there is/should be a small enterprise workshop with a technician on hand to help trainees if they want to produce fabrications for selling and as a kick start for creating their own business. (There will/should be a small fee for this as it must emphasize the business component with regards to overheads, labor time etc.)*

Aims and Objectives

Aims:

To help create Health & Safety awareness, decent work and working conditions, employability, self-esteem, knowledge and skills to improve the lifestyle of poor and disadvantaged youths and adults. *(Explain what the word "Aim" means)*

Objectives:

The course includes the following objectives/Unit; *(Explain what the word "Objective" means)*

Assessment & Guidance*: (Implemented prior to commencement of course)*

The pre-entry test is to determine what skills areas might better suit participant/s learning processes and **not** to exclude them. *(Note: Participants will need help if they are unable to read, write or understand)*

1. Participants will be given a formal document to write down relevant details including;
   - Educational and other information regarded as relevant.
   - Format to be used must be in line with the popular style and in accordance with the norms for that country or region.
   - They will be asked to indicate and record which skills area they have a preference for from the course list that is available.

2. Participants will be given a test paper that asks them specific questions related to how they may best learn.
   - This test will be used to evaluate their particular learning style in accordance with the Honey & Mumford learning styles questionnaire but could be from other tests of the same type.
   - The test will be evaluated while participants move unto parts three and four.

3. Participants receive information with regards to career guidance, and possible business opportunities related to training schemes available.

4. Participants will have the opportunity to see training in action and will able to talk with others already doing the courses. Again, this depends on if there are courses in progress or not.

5. Participants will be informed as to the results of the test and guided towards what skills area may best suit their learning processes.

6. Based on this information participants are asked once again to choose three skills areas in order of preference.

7. The results will be analyzed and candidates informed as to the availability of choices and to which sector would be appropriate based on the information forwarded.

8. Participants learning styles in this case would/should lean strongly towards that of the ACTIVIST as learning by doing is a dominant requirement in welding and fabrication.

9. Those that fall into the criterion requirements for welding and fabrication will be given first preference and while others will be directed to their most appropriate and/or chosen skills area.

10. It should be noted that the want to learn a particular skill irrespective of learning styles must also be seriously considered as it can be a powerful signal that shows a strong willingness to gain

knowledge and for this reason the participant may/will put extra effort into attaining his/her particular goal.

Note: It is vitally important that information from Assessment and Guidance is recorded accurately so that the theoretical model can be analyzed, adjusted or refined to meet any new, unknown or external criterion that may be impacting upon the assumptions which were considered relevant during its initial conception.

Course Content

Course Lessons:

Unit 1: Health & Safety:
Unit 2: Tools & equipment:
Unit 3: Materials (Ferrous & Non Ferrous etc.)
Unit 4: Using tools and equipment to manipulate materials:
Unit 5: Learning to measure cut and finish accurately:
Unit 6: Setting amperage, igniting and making straight lines with an electrode:
Unit 7: Making straight lines with an electrode and joining them using a weaving technique:
Unit 8: Down hand lap welding
Unit 9: Down hand Butt welding:
Unit 10: Down hand T Fillet welding:
Unit 11: Down hand open corner:
Unit 12: Horizontal lap welding:
Unit 13: Horizontal Butt welding:
Unit 14: Horizontal T Fillet welding:
Unit 15: Horizontal open corner welding:
Unit 16: Horizontal vertical lap welding:
Unit 17: Horizontal vertical Butt welding:
Unit 18: Horizontal vertical T Fillet welding:
Unit 19: Horizontal vertical open corner welding:
Unit 20: Vertical lap welding:
Unit 21: Vertical Butt welding:
Unit 22: Vertical T Fillet welding:
Unit 23: Vertical open corner welding:
Unit 24: Overhead lap welding:
Unit 25: Overhead Butt welding:
Unit 26: Overhead T Fillet welding:
Unit 27: Overhead open corner welding:
Unit 28: Welding and joining thin mild steel pipe, box section, small round, flat and square bar:
Unit 29: Conceptualize, draw, plan, cost, prepare, fabricate and weld a product using all knowledge, techniques and experience gained from Unit 1- 28: *(Sections of this Unit can commence earlier in the course.)*

Equipment & resources required per person:

1. Standard welding booth with workbench and clamping equipment.
2. Welding plant – Air/oil cooled – Single/Three phases. (Standard type)
3. Universal welding electrodes (14-12-10 swg)
4. Protective clothing and head wear.

5. Welding shield + glass
6. Chipping hammer.
7. Eye protectors for chipping.
8. Wire brush.
9. If possible a copy of the ZEUS hand book or equivalent. (Translated)

Equipment & resources for general use:

1. Health & Safety equipment. (General)
2. Eye protection goggles.
3. Ear muffs/defenders
4. Guillotine. (Power or hand.)
5. Oxy-acetylene cutting.
6. Pedestal grinder.
7. Hand power grinder.
8. Spare grind wheels.
9. Pedestal drill
10. Hand power drill.
11. Pipe threading equipment.
12. Power Hacksaw.
13. Hacksaws & blades
14. Drill bits
15. Measuring tape and steel rule.
16. Flat and round files.
17. Fernier calipers.
18. Protractors.
19. Steel set squares.
20. Steel dividers.
21. Straight edges
22. Scribers.
23. Chalk lines and string.
24. Spirit level & Plumb line.

Material resources (Can vary according to availability on the ground)

1. Mild steel plates/sheets 4mm thick.
2. Mild steel flat bar 4mm x 25mm & 50mm.
3. Mild steel round bar various gauges.
4. Mild steel square bar various gauges.
5. Mild steel pipe various gauges.
6. Mild steel box section various gauges.
7. Mild steel angle iron – 25mm x 25 mm & 50mm X 50mm.

Course Units

Day 1: Monday
Unit One:
(4 hours)

Course Introduction and Health & Safety: Classroom
Knowledge;

- Introduction and course overview.
  (Give out detailed course agenda and accreditation procedure)
- General Health & Safety in the workshop but should be considered as a good opportunity for inadvertent development. (*Spreading good practice in the community by using the trainees as purveyors of information – For instance never place electrical equipment or sockets near water)*
- Skills specific Health & Safety.
- First Aid.

- Use of visual aids where possible.

Handouts: Illustrated

Unit Two:
(4 hours)

Tools & Equipment: Workshop
Knowledge;

- Safety wear.
- Identify hand tools.
- How to use hand tools.
- Identify equipment; welding plant, grinders, guillotine, drills etc.
- How to use equipment.
- Identify welding electrodes and their properties.

Familiarize by letting participants touch, examine and ask questions.

Knowledge Test – Oral or written.

Mark results in Competency File: 1-10

Handouts: Illustrated.

Day 2: Tuesday
Unit Three:
(2 hours)

Materials: Workshop.
Knowledge:

- Identify ferrous and non ferrous metals.
- Identify common metals.
- Explain the differences in metals and how to tell them one from another (look – sound – magnetic properties etc)
- Explain metallic and chemical make-up of welding electrodes.
- Explain the dangers when trying to weld dissimilar metals.
- Explain that there are some electrodes that can be used to weld dissimilar metals.
- Identify pipe, box section, I section, angle iron, square bar, flat bar, round bar, sheet steel and plate and their uses.
- Explain their strengths and weaknesses.

Familiarize by letting participants touch, examine and ask questions.

Handout: Illustrated

Unit Four:
(6 hours)

Using tools and equipment to manipulate metals: Workshop:
Knowledge & Actions;

- Cutting with hacksaw.

- Cutting angle in box section to bend and form a right angle.
- Cutting angle in pipe to bend and form a right angle.
- Notching a pipe.
- Drilling holes – marking out, punching, clamping & boring holes etc.
- Cutting with a guillotine. (if available)
- Cutting using oxy-acetylene (if available)
- Bending pipe with and without machinery. (fill with sand)
- Rough cutting/gouging using an electrode.

Familiarize by letting participants try, touch, and use, examine and ask questions.

Knowledge Test – Oral or written – multi-choice.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 3: Wednesday
Unit Five:
(8 hours)

Learning to measure cut and finish: Workshop

Knowledge & Actions;
Part 1 Measurement (2 hours)

- Using a steel rule.
- Using a tape measure.
- Using a square.
- Using a protractor.
- Using a fernier caliper or micrometer to emphasis different degrees of measurement and relative accuracy requirements depending on job.
- Explain the principle of measure twice and cut once.
- Explain square checking by using the 3, 4, 5 principle.
- Explain checking square using diagonal measurements.
- Marking out a 90 degree angle using a straight edge, string and chalk.
- Drawing a circle with a piece of string and chalk.
- Using a spirit level and plumb line.
- Simple application of Pythagoras theorem using a calculator and show how and why it is used in real work situations.
- Explain technical drawing.

Part 2 Cutting, filing and squaring for accuracy (6 hours)

- Mark out a 50mm x 50mm square on a piece of 2, 3 or 4mm plate using a steel rule, square and scriber.
- Cut the required square to the outside of the line using a hacksaw.
- Use a flat file to finish accurately to the required dimensions.
- Check for accuracy of finishing using square and tape measure.
- Highlight the accuracy by showing the results according to a steel rule, a tape measure and a fernier caliper.

- Finished items must be stamped with the participants name and kept to the end of the course.

Familiarize by letting participants try, touch, and use, examine and ask questions.
Indicate the costs of materials and reinforce it by having samples placed on a white board.

Mark results in Competency File: 1-10
Handouts: Illustrated

Day 4: Thursday
Unit Six:
(4 hours)

Setting amperage, igniting and making straight lines with a 10-12 SWG electrode.

Down-hand position:

Equipment/Materials;
- 120mm x 120mm x 4mm plate.
- 10 or 12 SWG electrodes.

Knowledge & Actions;
- Give a one hour theoretical lesson with pictures. (All positions)
- Set amperage.
- Learn the correct electrode angle in relation to the plate
- Learn to ignite electrode
- Stopping and starting.
- Making straight weld bead lines along the plate.
- Stopping and rejoining the weld bead.
- Chip slag from weld and clean with a wire brush.

Unit Seven:
(4 hours)

Making straight lines with an electrode and joining them using a weaving technique.

Equipment/Materials;
- 120mm x 120mm x 4mm plate.
- 10 or 12 SWG electrodes.

Knowledge & Actions;
- Make two straight lines close together and weave between them using a side to side motion with the welding electrode.
- Make a weave joint when restarting.
- Chip slag from weld and clean with a wire brush.

Tricks of the trade:
- Restart technique.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 5: Friday
Unit Eight:
(8 hours)

Down hand lap welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10 or 12 SWG electrodes.

Knowledge & Actions;

- Give a one hour theoretical lesson with pictures. (All positions)
- Set one plate on the top of the other to form a lap.
- Tack the ends of the plate together.
- Set the angle of the electrode.
- Weld the plates together along the length of the lap.
- Turn the plate over and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated
Tributary learning 1: Technical Drawing. (Drawing straight lines, circles, squares, triangles, right angles & bisecting lines)
Tributary learning 2: Measurements (Simple practical diagrams to help trainees understand why mathematics is important in skills training)
Tributary learning 3: Introduction to small business training. (Looking at the cost of materials and consumables: Give trainees a list of materials that they need to check out in shops)

Explain that tributaries will be checked and marked every week and will be used as part of their final accreditation.

Day 6: Monday
Unit Nine:
(8 hours)

Down hand Butt welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set both plates together edge to edge with a gap the same width as the metallic core of the electrode.
- Tack the ends of the plate together.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate over and weld the other side.
- Chip slag from weld and clean with a wire brush.

Tricks of the trade: May need run-on plate due to magnetic arc pull.

Mark results in Competency File: 1-10

Handouts: Illustrated.

Day 7: Tuesday
Unit Ten:
(8 hours)

Down hand Fillet welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set one plate on top of the other to form a T joint.
- Tack the ends of the plate together.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 8: Wednesday
Unit Eleven:
(8 hours)

Down hand open corner welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set two plates together edge to edge to form a 90 degree angle.
- Tack the ends of the plate together.
- Set the two ends down on the bench in an inverted V shape so that the open corner is exposed,
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side for further welding practice in a V shape.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: illustrated.

Day 9: Thursday.
Unit Twelve:

(8 hours)

Horizontal lap welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Give a one hour theoretical lesson with pictures. (All positions)
- Set one plate on the top of the other to form a lap.
- Tack the ends of the plate together.
- Clamp in a horizontal position.
- Set the angle of the electrode.
- Weld the plates together along the length of the lap.
- Turn the plate over and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated.

Day 10: Friday.
Unit Thirteen:
(8 hours)

Horizontal Butt welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set both plates together edge to edge with a gap the same width as the metallic core of the electrode.
- Tack the ends of the plate together.
- Clamp in horizontal position.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Tricks of the trade: May need run-on plate due to magnetic arc pull.

Mark results in Competency File: 1-10

Tributary learning 1: Marking, feedback and set next lesson or action.
Tributary learning 2: Marking, feedback and set next lesson or action.
Tributary learning 3: Marking, feedback and set next lesson or action.

Handouts: Illustrated

Day 11: Monday.
Unit Fourteen:
(8 hours)

Horizontal Fillet welding of thin mild steel:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set one plate on top of the other to form a T joint.
- Tack the ends of the plate together.
- Set the angle of the electrode.
- Clamp in the horizontal position.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated.

Day 12: Tuesday.
Unit Fifteen:
(8 hours)

Horizontal Open Corner welding of thin mild steel:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set two plates together edge to edge to form a 90 degree angle.
- Tack the ends of the plate together.
- Clamp in the horizontal position.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side for further welding practice in a concave V shape.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: illustrated.

Day 13: Wednesday.
Unit Sixteen:
(8 hours)

Horizontal vertical lap welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10 SWG electrodes.

Knowledge & Actions;

- Give a one hour theoretical lesson with pictures. (All positions)

- Set one plate on the top of the other to form a lap.
- Tack the ends of the plate together.
- Clamp in a horizontal – vertical position – 45 degrees.
- Set the angle of the electrode.
- Weld the plates together along the length of the lap.
- Turn the plate over and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated.

Day 14: Thursday.
Unit Seventeen:
(8 hours)

Horizontal vertical Butt welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set both plates together edge to edge with a gap the same width as the metallic core of the electrode.
- Tack the ends of the plate together.
- Clamp in horizontal vertical position – 45 degrees.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Tricks of the trade: May need run-on plate due to magnetic arc pull.

Mark results in Competency File: 1-10

Handouts: Illustrated.

Day 15: Friday.
Unit Eighteen:
(8 hours)

Horizontal vertical Fillet welding of thin mild steel:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set one plate on top of the other to form a T joint.
- Tack the ends of the plate together.
- Set the angle of the electrode.
- Clamp in the horizontal vertical position – 45 degrees.
- Weld the plates together along the length of the abutment.

- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Tributary learning 1: Marking, feedback and set next lesson or action.
Tributary learning 2: Marking, feedback and set next lesson or action.
Tributary learning 3: Marking, feedback and set next lesson or action.

Handouts: Illustrated

Day 16: Monday.
Unit Nineteen:
(8 hours)

Horizontal vertical open corner welding of thin mild steel:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set two plates together edge to edge to form a 90 degree angle.
- Tack the ends of the plate together.
- Clamp in the horizontal vertical position – 45 degrees.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side for further welding practice in a concave V shape.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 17: Tuesday.
Unit Twenty:
(8 hours)

Vertical lap welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10 SWG electrodes.

Knowledge & Actions;

- Give a one hour theoretical lesson with pictures. (All positions)
- Set one plate on the top of the other to form a lap.
- Tack the ends of the plate together.
- Clamp in a vertical position – 90 degrees.
- Set the angle of the electrode.
- Weld the plates together along the length of the lap.
- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 18: Wednesday.
Unit Twenty One:
(8 hours)

Vertical Butt welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set both plates together edge to edge with a gap the same width as the metallic core of the electrode.
- Tack the ends of the plate together.
- Clamp in vertical position – 90 degrees.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Tricks of the trade: May need run-on plate due to magnetic arc pull.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 19: Thursday.
Unit Twenty Two:
(8 hours)

Vertical Fillet welding of thin mild steel:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set one plate on top of the other to form a T joint.
- Tack the ends of the plate together.
- Clamp in the vertical position – 90 degrees.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 20: Friday.
Unit Twenty Three:
(8 hours)

Vertical open corner welding of thin mild steel:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set two plates together edge to edge to form a 90 degree angle.
- Tack the ends of the plate together.
- Clamp in the vertical position – 90 degrees.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side for further welding practice in a concave V shape.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Tributary learning 1: Marking, feedback and set next lesson or action.
Tributary learning 2: Marking, feedback and set next lesson or action.
Tributary learning 3: Marking, feedback and set next lesson or action.

Handouts: Illustrated.

Day 21: Monday.
Unit Twenty Four:
(8 hours)

Overhead lap welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10 SWG electrodes.

Knowledge & Actions;

- Give a one hour theoretical lesson with pictures. (All positions)
- Set one plate on the top of the other to form a lap.
- Tack the ends of the plate together.
- Clamp in an overhead position.
- Set the angle of the electrode.
- Weld the plates together along the length of the lap.
- Turn the plate over and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 22: Tuesday.
Unit Twenty Five:
(8 hours)

Overhead Butt welding of thin mild steel plate:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set both plates together edge to edge with a gap the same width as the metallic core of the electrode.
- Tack the ends of the plate together.
- Clamp in overhead position
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Tricks of the trade: May need run-on plate due to magnetic arc pull.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 23: Wednesday.
Unit Twenty Six:
(8 hours)

Overhead Fillet welding of thin mild steel:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set one plate on top of the other to form a T joint.
- Tack the ends of the plate together.
- Clamp in the overhead position.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 24: Thursday.
Unit Twenty Seven
(8 hours)

Overhead open corner welding of thin mild steel:

- Two pieces 120mm x 75mm x 4mm plate.
- 10-12 SWG electrodes.

Knowledge & Actions;

- Set two plates together edge to edge to form a 90 degree angle.
- Tack the ends of the plate together.
- Clamp in the overhead position.
- Set the angle of the electrode.
- Weld the plates together along the length of the abutment.
- Turn the plate around and weld the other side for further welding practice in a concave V shape.
- Chip slag from weld and clean with a wire brush.

Mark results in Competency File: 1-10

Handouts: Illustrated

Day 25: Friday.
Unit Twenty Eight
(8 hours)

Welding and fabricating thin mild steel pipe, box section, small round, flat and square bar:

Knowledge & Actions

- Cutting angles in pipe to give a desired shape – 90 – 45 degrees etc.
- Cutting angles in box section to give a desired shape.
- Cutting angles in angle iron to give a desired shape.
- Bending and forming pipe, flat and round bar.
- Power Hacksaw.
- Joining metals using other forms of connections – pipe threading, annealing, pinning, riveting etc.
- How to put a new edge on a steel chisel. (heat Treatment)
- How to case harden various components.
- How to work with and when to use oil with drill bits.
- Making a jig for multiple copies.
- Consider ways of making simple tools i.e. a pipe bender from a hydraulic jack etc.

Mark results in Competency File: 1-10

Tributary learning 1: Marking, feedback and set next lesson or action.
Tributary learning 2: Marking, feedback and set next lesson or action.
Tributary learning 3: Marking, feedback and set next lesson or action.

Handouts: Illustrated.

Day 26: Monday.
Workshop Experience
(8 hours)

Knowledge:
Arrange a trip for participants to see welding and fabrication in action. Choose the best example so that they can see the standards that are acceptable.

Tributary learning 1: Final Marking & feedback.
Tributary learning 2: Final Marking & feedback.
Tributary learning 3: Final Marking & feedback.

Day 27: Tuesday.
Unit Twenty Nine Part 1:
(8 hours)
Unit 29: Conceptualize, draw, plan, cost, prepare, fabricate and weld a product using all the knowledge, techniques and experience gained from Unit 1- 28.

Using Knowledge & Converting it into Actions:

1. Conceptualize: Participants must think about something that they would like to make and might be sellable in the open market.
2. Draw the item using techniques learned from tributary learning.
3. Plan how to go about making the item and work out how much it would cost. Participants should consider all costs involved and be given an information sheet on how to go about this. It should include overheads, labor-time, profitability and other relevant data.

Day 28: Wednesday.
Unit Twenty Nine Part 2
(8 hours)
Using Knowledge & Converting it into Actions:

1. Prepare all materials for fabrication including cutting to length drilling etc.

Note: If there were a small enterprise workshop available this would be the time to use it.

Day 29: Thursday.
Unit Twenty Nine Part 3
(16 hours)
Using Knowledge & Converting it into Actions:

2. Participants make and finish the actual product they have designed.
3. Participants can take the product home with them.

Mark results in Competency File: 1-10

Day 30: Friday.

Reflection, Presentation & Final Analysis
(8 hours)
Course Completion:

- Identify possible business outlets and discuss costs etc.
- Discuss and record the merits and short-comings of the course. What could be done better and what areas need to be improved upon.
- Discuss if the learning styles guidance given during the Assessment Phase was a benefit or otherwise.

- Discuss with individual trainees their final competence accreditation and how that result was reached.
- Present the trainee with their Certificate of Competence. (Indicate all competences)
- Instructors and Managers must analysis all the key features and work on how to improve them and what directions it might take in the future.

Summary:

In summing up, it is evident that vocational inadequacies are having a particularly negative effect upon the economic condition of numerous developing countries. While some interventions are making inroads, others can be seen to be falling short of their intended goals. Indeed, some tend to be very minimalistic and furthermore, omit important elements that need to be incorporated to provide an inclusive learning experience. This apparent condition clearly demonstrates the necessity to comprehensively explore key considerations at a much deeper levels.

Uneducated and socially deprived youths and adults have very few opportunities except to work in informal sectors, but could be the economic engine that will drive countries forward if they are given adequate resources and quality training in technical vocations. Curriculum designers need to ensure that they include critical background knowledge in all of the applicable sectors.

Technical skills can be complex with numerous of them having their origins and knowledge derived and disseminated through equally complicated languages. Descriptions and explanations can be difficult to communicate to persons with much simpler vernaculars and underdeveloped intellectual abilities. Models must reflect these circumstances by utilizing methodologies that make use of interactions, senses and emotionally responsive teaching and training aids that are attuned to the target group.

Where possible, trainers should indentify students' strengths and weakness by looking closer at their learning styles before enrolling in specific courses. Implementing procedures that can recognize traits that are inherent to individual demeanor can, a) better recognize courses that are suitable to personal qualities, b) save time and finances on trainees opting out, and c) enhance the success rate of learners completing the training satisfactorily.

When models are being conceptualized, they need to be appropriate for the local conditions and respond to the actually as experienced on the ground. Furthermore, reflecting upon the realities and requirements for discrete regions and communities can provide curriculum writers with the necessary information to target and modify courses more accurately. It is also evident that, consideration must be given to what trainees can and cannot have access to, given their social disposition.

While gender and equal opportunities issues are extremely important they need to be balanced with national and regional realisms. Advocating external agendas that are taken onboard enthusiastically in one country can be seen to be swimming against the tide of culture, history and tradition in another. When promoting skills related programs it is vitally important to research the actualities, while great care must be taken to ensure that they are appropriate and really do make a tangible difference.

Introducing supplementary knowledge is essential to compensate for a lack of inclusive early learning, or indeed, no formal educational background. Aspects of health and safety, deconstruction, tributary learning, tricks of the trade, basic business awareness and other background information

depending on the particular trade or skill must be woven into the curriculum. Basic courses compiled for the target group in question are not sufficient to make up for the educational tools they were not accorded in the first instance.

Grading theoretical and practical activities for accreditation purposes must reflect trainees' actual abilities and be clearly stated in any final certification. It is extremely important that there is a minimum of subjectivity and those participants are well aware of how they are being graded throughout the course.

Unmistakably, teaching and training techniques in the classroom and workshop are the single most important factor in the trainees learning experience and must be applied through quality teachers and methods that are best suited to the target group. However, a quality curriculum is only as good as those who deliver it and when this is not up to required standards, it is therefore essential that the training of teachers and instructors is also inclusive so that they fully understand all of the issues concerned.

The "Model" outline as presented was drawn up in order to show what needs to be included and also how it can be woven into the fabric of the course. However, the most important point being alluded to, is the fact that basic courses are in many cases insufficient in providing educationally and socially deprived youths and adults with the essential tools to positively develop their economic condition. Governments and organizations must provide essential resources, inclusive curriculums, quality teachers and support systems if they are to make a real difference to the present circumstances at local and national levels.

Addendum:

A) Resources:

Resources are always a major issue in developing countries but there may be alternative ways of dealing with the situation.

Along with the usual contributors, organizations can look at;

- Servicing and maintaining vehicles for government departments.
- Servicing and maintaining government buildings and other constructions.
- Working with government contractors.
- Making commodities and products for government constructions.
- Producing or finishing products for local businessmen.
- Producing products for the private sector.

Note: By examining these identifiable sectors it may act to give trainees valuable practical experiences in the real world and may also help to create possible business opportunities.

B) Research Criterion; External and Systemic Relationships:

Government Departments & Institutions:

It is essential to forge relationships with relevant national and local government departments as applicable. These should include primary sectors like;

- **E**ducation and Employment

Closely followed by;

- **W**orks, Health, Social Welfare, Statistics, Environment, etc, if or when they do exist.

Further relationships can be made with;

- **P**olice, Security agencies, Fire and Ambulance services.

These links are important for the following reasons;

1. **S**o that all agencies are aware of the specifics, modus operandi of the project and clarify that working collectively, communications, best practice and transparency are key criterions.
2. **I**n order to investigate what each agency can contribute to the project and what possible advantages can be gained from the relationship.
3. **T**hat the target group is the most important factor in the project.

Institutions:

Associations with institutions are also essential and these should consist of;

- **G**overnment training schools and/or centers.
- **I**nternational and private training agencies.
- **S**chools, colleges, universities and libraries.

Trade Unions:
Trade unions and workers committees play a very vital role in social development as they act as a catalyst for positive changes in health, safety, general working conditions and wage levels. They are usually well aware of the intricacies and interpretations of labor law.

Community Groups and Local NGOs:
Community groups and Local NGOs can provide helpful information regarding the general and specific needs of the local population and can highlight skills and service issues that need to be addressed.

The Commercial Environment:
If the intention is to set up a skills related project or improve a current state of affairs in a specific region or conurbation which is intended to assist the socio-economic condition, there are key questions that need to be asked.

Local Characteristics:

a) What is the socio-cultural landscape?
b) What is the social demography?
c) What are the poverty levels and how are they measured?
d) What is the geographical landscape?
e) What are the weather conditions?
f) What utilities are in place and how efficient are they?
g) What communications facilities are available?
h) What are the key resources?
i) What, if any, are the raw materials incoming or outgoing?
j) What, if any, are the incoming and outgoing commodities or services?
k) What are the logistical systems?
l) What are the standard storage systems?
m) What is the main business in the area?
n) What are the secondary businesses?
o) Are there local markets places?
p) What is the general condition of the businesses?
q) What is the quality and quantity of business output?
r) What are the current economic conditions?

Human Resources

a) What is the proposed catchment area?
b) What is the main skills being used in the area?
c) What is the availability of key skills?
d) What skills are needed?
e) What is the overall percentage of workers in the formal market?
f) What is the overall percentage of workers in the informal market?
g) What are the tradition male working area sectors?
h) What are the traditional female working sectors?
i) Is there an outward migration?
j) What areas of labor are the most exploited and why?
k) What are the attitudes towards work and working conditions?
l) What are the attitudes towards gender and equal opportunities?
m) What are the attitudes towards environmental issues?

Human Resources and Education:

a) Are there adequate facilities for teaching and training of vocational skills?
b) What is the level of teaching and trainers?
c) Is there a shortage of teachers and trainers?
d) Are there adequate resources for teaching skills?
e) What is the percentage of school leavers entering the labor market?
f) What skills do school leavers possess?
g) What are the skills levels according to accreditation?
h) What is the actual level of accreditation?
i) When teaching skills related subjects are they academically or vocationally weighted.
j) What percentage enters the formal labor market?
k) What percentage enters the informal market?

Key questions when considering business related interventions:

a) Are there any possibilities for doing works on behalf of government departments and /or businesses?
b) Servicing vehicles, machinery, utilities.
c) Maintaining buildings and other constructions.
d) Producing products or spare parts.
e) Is there any commodities being imported from outside locations that could be produced in the location.
f) Is there any products being imported from outside the country that could be made on site.
g) Are there any possibilities for interagency projects?
h) What are the average prices of all commodities in relation to other areas?
i) Is there any obvious trends?
j) Are there any new businesses opening?
k) Are there any possibilities for opening businesses that do not already exist?
l) Are there any businesses that are going out of the market and closing down?
m) Are there any obvious gaps in the market?
n) Are there possibilities for producing new commodities or concepts?
o) Are there possibilities for reinventing old commodities?
p) Are there new and efficient ways of producing commodities that could be installed?
q) What are the environmental impacts of any interventions?

Access:

- What is the intended or actual geographical position of the project?
- What is the distance and transport access to the location?
- Are public transport costs prohibitive?
- What is the main mode of public transport?
- What is the main mode of private transport?