THE JOURNAL OF TEACHING ENGLISH FOR SPECIFIC AND ACADEMIC PURPOSES
Vol. 3, N° 1, 2015, pp. 101–114

UDC (811.111'276:061.7):6

SCHEMA FOR POSTER DESIGN, DEFENSE AND ASSESSMENT

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Abstract. *This study intends to fill in a gap through attempting to make available to readers and educators in the field of teaching English communication skills at tertiary level information on poster design, defense and assessment. This information is based on practical applications of the use of poster presentations by engineering students in a professional communication course for junior year engineers where there is a substantial focus on poster design, poster rhetorical structure, use of visuals, managing the presentation; coordination between team members, transition from one member to another, and written and oral communication skills. The poster presentation can be viewed as a pedagogical tool and as having considerable agency in promoting and enhancing students' professional communication skills and meta-cognitive capacity. It places emphasis on team-role behaviors, giving credence to personal, inter-personal and team learning.*

Key words*: Poster design, poster defense and assessment, oral and written skills, multidisciplinarity, engineering education*

1. INTRODUCTION

The shift of focus in the teaching and learning paradigm on developing excellence in communication skills and the requirements of the labor markets for engineering graduates with well-developed professional communication skills, collaborative work practices, effective self-management and a clear understanding of social responsibility (El-Sakran and Prescott 2013; Prescott, El-Sakran, Albasha Aloul and Al-Assaf 2011; 2012) have brought in several changes in syllabus and course design. Salehi and Daryabar (2014) note that learning presentation skills makes learners responsible for their learning and helps increase their speaking and interpersonal confidence. In the same vein, Kassim and Ali (2010) call for more focus on oral communication skills for engineers. In a related study, Cianflone (2011) discusses professional and formal poster presentations delivered in conferences and how they allow interactivity between presenter(s) and audience.

Another relevant study was conducted by Brandt (2009) in which she argues that academic speaking skills can be better developed through poster presentations. Brandt points out that poster presentations develop these skills better than PowerPoint presentations as PowerPoint presentations can have a negative, reductive, effect on presentation content. She further reports that as a result of students rehearsing and memorizing the content of their PowerPoint presentations, it becomes difficult for assessors to precisely and appropriately assess students' levels of understanding of the materials. By contrast, poster presentations allow assessors to discern students' levels of understanding through asking questions about the different sections of the poster. Brandt (op. cit.) aptly

Submitted March 8th, 2015, accepted for publication April 8th, 2015

argues that poster presentations demand active participation in a communicative relationship in the form of interaction between presenter and audience. The audience at a poster display is a willing one, able to take on a number of possible roles. That is to say that poster presentations support a transformational, democratic, approach to learning in which both presenter and audience are viewed as equals who are able to learn from each other during the course of the event. The process can allow for and encourage critical reflection, the negotiation of meaning, the seeking and giving of clarification, and the development of understanding. These are all essential skills for students in higher education contexts to develop as they learn to articulate complex ideas that may not comfortably be reduced to a bullet point.

Rowe and Ilic (2009, 7) note that "a poster … needs to provide clear navigation in either vertical (top to bottom or vice (sic) versa) or horizontal (left to right or vice (sic) versa) planes in order to provide a sequential logic." Rowe and Ilic further add that the information provided in posters needs to be supplemented by some form of oral presentation, or author presence, to further communicate the content.

Although these studies discuss the benefits of poster presentations in developing presentations skills, self-confidence and interaction between presenter and audience, they hardly provide any information on poster design skills, team poster presentations and poster design and presentation assessment guidelines.

2. Objective of this Paper

This study, therefore, intends to fill in a gap through attempting to make available to readers and educators in the field of teaching English communication skills at tertiary level information on poster design, defense and assessment. This information is based on practical applications of the use of poster presentations by engineering students in a professional communication course for junior year engineers where there is a substantial focus on poster design, poster rhetorical structure, use of visuals, managing the presentation; coordination between team members, transition from one member into another, and written and oral communication skills.

3. Why Poster Presentation?

Poster Presentation is chosen as a medium of oral presentation as it has several advantages over slide-ware presentations such as PowerPoint or Prezi. In the first place, PowerPoint presentations tend to be language reductive; students often simply repeat what is on the screen. Secondly, students may simply memorize a presentation, and this selective memorization may not reflect a true level of understanding of the material. Furthermore, audiences in PowerPoint presentations frequently become passive and disengaged because it is difficult for them to interact, to seek clarification for example, during a PowerPoint presentation. The artificial situation of taking questions at the end of a presentation does not allow for pertinent, spontaneous questioning.

Another significant advantage of the poster presentation is the emphasis it places on the socio-cultural aspect of language use and exchange. This can be readily noted in the manner in which presenters respond to the audience with appropriate language in the natural forum of the poster presentation. Adoption of suitable language accommodation

strategies for an educated, non-specialist audience is an aspect of this type of setting. Students are assessed first on their ability to identify and display key points in such a way that meaning can be constructed by a viewer and further on their ability to discuss and expand on the information presented in this display in a manner appropriate to a semi-formal academic forum.

4. THEORETICAL BASES

4.1. Language

It was important that the poster presentation be guided by a model that gave due emphasis to the significance of language in the communication process. Halliday's (1985) systemic-functional linguistics, an approach to linguistics that treats language as foundational for the building of human experience, provided such a model. Three key notions, *field*, *tenor* and *mode* (Halliday ibid: 12) which collectively constitute the register of a text, offered a linguistic framework for guiding the poster presentation and giving due importance to the language that underpins the communication process.

Field is defined as what is happening, as the nature of the social interaction taking place. *Tenor* relates to those taking part, to the participants, their social/professional roles, their relationships and their status. *Mode* refers to the organization of text, to rhetorical modes such as persuasion, exposition, didacticism, description, narration and so forth; to the channel of communication whether spoken or written, monologic or dialogic, whether with visual contact or via computer-mediated communication or telephone and so forth. The framework assumes language functions common in engineering (definition, description, explanation, exemplification, comparison and contrast, sequencing, hypothesizing and drawing conclusions) and thus the language structures that convey these functions.

In the poster work students can be considered to be working in the area of multimodality and social semiotics, fields of language and communication that draw on the work of Hodge and Kress (1988), Kress and van Leeuwin (1996) and as well as on Halliday (1978). In particular Halliday's work on the grammar of English and the three purposes, interpersonal, ideational and textual is both germane and applicable to the students' poster work. In Halliday's ideational terms the posters represent ideas about the world and they facilitate both social and interpersonal interactions between student presenters and the viewing audience(s). The textual elements of the posters, visual and written are connected through the oral explanations offered by the student teams which seek to transform the visual and written ideas into meaningful texts. The multimodality of the posters as text is completed in the aural sense by the viewing audience who are an integral part of the sociocultural exchange as active listeners and questioners seeking further information, clarifications and challenging ideas, assumptions and conclusions.

The relevance of Halliday's work and that of Kress, Hodge and van Leeuwin situates the student poster work as significant contemporary communication artefacts. The propositions that "language is a social fact" (Halliday 1978, 1), that its functions have evolved "to serve in people's lives" (1978, 4) and that the metafunctions of language; ideational, interpersonal and textual are the aspects that together make texts relevant to their context informs the student work in this genre. Kress and van Leeuwen's (1996) ideas which build on Halliday's framework by providing new "grammars" for other semiotic modes incorporate visual and aural modes into communication giving prominence to the importance of the visual mode in contemporary communication.

5. Practical Bases

5.1. Application

Poster preparation and presentations, in addition to the linguistic and communication elements above, are intended to allow engineering students opportunities to:

- demonstrate knowledge of engineering disciplines
- exhibit how they design and conduct investigations, as well as analyze and interpret data
- show their ability to design a system, component or process to meet their project objectives within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability
- work and function effectively in multidisciplinary teams to accomplish a common goal
- practice identifying, formulating and solving engineering problems
- demonstrate an understanding of professional, ethical responsibilities and team roles
- show an ability to communicate effectively with a wider technical and non-technical audience
- exhibit an understanding of the impact of engineering solutions in a global, economic, environmental and societal context
- demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering research and practice
- interact with a real audience and negotiate meaning.

6. Stages of the Poster Presentation Process

6.1. Development of poster content

- Choosing an engineering multidisciplinary topic for a semester-long research project
- Surveying the relevant literature on the selected research topic and selecting the most pertinent material
- Deciding on clear, uncluttered and logically arranged key points
- Using the Situation, Problem, Solution and Evaluation (SPSE) format or Swales' (1990) Introduction, Method(s), Results, Analysis, Discussion (IMRAD) pattern to structure key points and supporting information
- Drafting and editing text-body to include: introduction with an overview of the contents, including the purpose, background and scope of the project; clear statements of parameters and approach; findings reflecting detailed and viable SPSE structure or IMRAD pattern; informative headings with logical, progressive order.

6.2. Preparations leading to the poster presentation

EL-Sakran and Prescott (2013) have devised the following steps for the poster presentation:

Teams of a minimum of three engineering students and a maximum of five from at least three different engineering disciplines choose a research topic and prepare a proposal.

The proposals are submitted to the English language course professor and an engineering professor for comments and feedback.

Teams work on the research and give an oral progress report part way through the semester and receive feedback from colleagues and course professor.

Team members attend a one-hour lecture in which a design professor outlines essential aspects of poster design such as size, color choice, text/image ratio, formatting and visual balance.

Teams prepare and design poster using information from the lecture as well as free access online poster samples and design sites.

Teams are presented with dates for presenting and defending posters.

7. Poster Design and Communication

Four important aspects of poster design for communication are emphasized in this stage of the preparatory work.

- First, the uniform proportional relationships of the A paper series are explained showing in particular how images within the poster can retain a proportional integrity to the overall poster dimensions and consequently aid viewer readability and the processing of visual information.
- Second, the relationships between text and image are explained and illustrated. The students are introduced to a three column layout using a landscape orientation. This allows for an appropriate number of words/characters per line, again to aid viewer readability. An acceptable balance between text and image is an important aspect of effective engineering project poster design. Students are shown the advantages of text/image ratios approaching 60/40 and the disadvantages of imbalance where either text or image dominates and reduces the textual and information balance. Choosing or creating images, diagrams, figures, tables, drawings, charts and so forth to support the SPSE or IMRAD structure of the text is a complex process which requires students to think critically about the informational and content relationships between language and visual representation.
- Third, the importance of structuring a hierarchy of information within the poster is explained and illustrated with effective and dysfunctional examples. The use of sans serif fonts for major headings and serif font for body text is discussed and the necessity of providing a clear graded relationship between primary and secondary headings within the poster to aid viewer understanding of informational relationships is emphasized again with the aid of illustrative examples. The value of logical flow of information from top left to bottom right within the poster is highlighted.
- Fourth, the need for legibility within the poster is dealt with. For this aspect of the poster the concern is ensuring the information clear and readable. It is important that key information is visible from 3-5 meters, that the background enhances rather than obscures the information in the poster, that color is compatible with the project topic and supports the textual and visual information and that there is sufficient information in the poster to sustain an oral explanation of the project without overloading the reader or eliminating the need for engagement with the student team.

A table summarizing these design and communication features is at Appendix 1.

8. In-class Preparations

The students work to a task description which, importantly, includes phrasing an accurate poster presentation title. To this point in the engineering multi-disciplinary project work student teams have presented their work in-house; the poster presentation is

their first venture into a more public forum. It therefore presents teams with an appropriate opportunity to review the working title of their project, one that reflects the central concerns of their work and conveys this interest to the viewing audience.

Other work in-class concerns the formatting of principal elements of the poster in line with the principles embodied in the four stages of poster design described earlier. These principles include developing a hierarchy of titles, section titles and sub-titles; selecting and composing content for the body text that illustrates the engineering concerns at the core of the project and appropriately locating the visuals to produce a logical interface between these and the text elements they relate to. Finally, labeling visuals appropriately and consistently, referencing with IEEE citation conventions images, quotations and text elements is necessary to impart a uniformity consistent with the design coherence which the posters aspire to.

9. Poster Presentation, Defense and Assessment

The main assessment objectives of the poster presentation are to test team members' interactive communication skills and their abilities and competence to explain technical engineering information to non-technical audiences. The student teams are assessed on the poster layout, use of visuals, contents (results, discussion, methodology used, analysis and conclusion). Criteria for assessing the posters are provided to the assessors and the presenters (see Appendix 1) with focus on time management, question referral, ability to simplify technical information for a non-technical audience, coordination between presenters, use of interactive expressions and language referring to visual elements, justifications for topic choice, persuasion, accepting and acknowledging research limitations. Typically assessment teams comprise two faculty and a senior or graduate student. Assessors each make an individual evaluation based on the criteria; these are tallied and averaged to arrive at a total for each student team. Rater reliability is addressed by pre-assessment training which discusses poster samples in the context of the assessment criteria and importantly uses input from experienced assessors to aid less experienced colleagues and senior/graduate students achieve a working understanding of a range of attainment in the three categories; content, visual display, oral explanation.

9.1. Assessment criteria

Assessment criteria cover:

- Poster format which includes layout, contents, font size, use of visuals, use of captions to refer to visuals, color, background, use of sections headings and sub-headings
- Language which shows awareness of coherence and cohesion with clear use of appropriate linking adverbials (therefore, as a result, consequently)
- Appropriate use of inclusive expressions to involve the audience in discussion (as you see, if you look here, as you can see from Table x, according to this figure)
- Signaling transition from a team member into another
- Fluency appropriate to an oral/aural exchange
- Accuracy of language used
- Time taken to respond to questions
- Maintaining adequate eye contact and engagement with audience.

A copy of the assessment instrument is at Appendix 2

9.2. Bloom's taxonomy and communication process outcomes

The poster presentation and assessment activities fall within Bloom's (1956) three domains: affective, psychomotor and cognitive. Through the poster preparation and presentation, the students attain the following objectives:

- Exhibit use of appropriate and effective standards and strategies in professional (engineering) communication
- Demonstrate writing and presentation style sensitive to audience and message function
- Exhibit individual, collaborative and multidisciplinary technical communication skills
- Demonstrate understanding of appropriate content, format and graphics for professional (engineering) documentation and presentations
- Display awareness of ethical and social responsibility issues that arise in technical research and documentation
- Perform constructive and supportive team roles through appropriate team behaviors
- Understand individual and team work responsibilities
- Learn about other team members' academic disciplines

At an affective level these objectives embody skills of valuing information, accommodating diverse ideas and ideals. Attainment of these skills enables students to compare and to elaborate on what is known and what has been learned in order to enhance their beliefs and standards. Preparing and presenting the poster as multimodal discourse with supporting organizational documentation exemplifies cognitive skills. The work requires students to use analysis, inference, and synthesis in the compilation and patterning of the discourse and the information. The skill of evaluation, in the presentation and defense of research requires making judgments about information, and attesting the validity of ideas and quality of work based on given criteria.

10. Overall, Students were able to:

- Evaluate written and oral communication, identify key ideas and establish hierarchies of information, work collaboratively in teams: and
- Structure clear and persuasive arguments based on an analysis and presentation of evidence.

11. Feedback from the Students

Student presenters value the experience and requested its continued use with future cohorts. Poster presentations cater for different learning styles and allow for personality preferences, students' creativity in poster design and they clearly show each team member's contribution to the research projects. Posters provide a full picture of the research, and they allow the audience(s) to ask questions on any issue without having to follow a pre-determined presentation order as it is the case with PowerPoint presentations. In other words, the order of questions is decided by the audience. Poster presentations prepare students for relevant community membership by getting them engaged in interactive tasks that they will be required to undertake in the future when they participate in conferences. In this way the fact that students may be subject to criticism or challenge through the assessors' expression of opinions opposing those adopted by the poster presenters is seen as excellent preparation for professional or academic life.

Engineering students at the American University of Sharjah present posters to support their capstone senior design projects, therefore the work in this professional communication course for junior year engineers has an immediate and tangible benefit. Furthermore, many senior and graduate engineering students at the American University of Sharjah are selected for regional and international student seminars and forums, some engineering oriented but many multi-disciplinary. AUS students can participate in these forums with confidence as they have developed the skills to present ideas through effective poster design and presentation.

12. CONCLUSION

The poster presentation can be viewed as a pedagogical tool and as having considerable agency in promoting and enhancing students' professional communication skills and meta-cognitive capacity. It places emphasis on team-role behaviors, giving credence to personal, inter-personal and team learning. This learner-centered approach, where team members are actively engaged in the discovery and construction of their own knowledge and meaning through attempting solutions to real problems from their surrounding environment echoes Choo's (2007, 187) statement that "there is an increasing need to train students to solve real-world problems so that they can handle complex problems in their workplace." Professors' and students' deliberations on the poster presentation and the way it is conducted underscore the following benefits:

- Shift focus from teacher-centered practices to students' collaborative learning-centered environments, resulting in improved student autonomy, positive self-perception, self-regulation and responsibility (Rilling and Dantas-Whitney 2009; Zimmerman 2002).
- Provide learners with real opportunities to create their own texts, engage in real communication tasks and reflect on the outcomes of their communication processes.
- Use language for real purposes. Rilling and Dantas-Whitney (2009, 2) rightly argue that "the goal of using and creating language for real-world purposes within language instruction is to bring authenticity to the learning experience…"
- Develop in students "transferable skills and knowledge" (Chun 2010, 24).
- Provide an "interdisciplinary, student-centered approach to teaching focused around student-generated projects (Stipe and Yasen 2009, 130).
- Promote interdisciplinarity and team work in engineering education (Harrison, Macpherson and Williams 2007).

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APPENDIX 1

Table 1 Poster Design Features

A paper series	Text & Image	Hierarchy of Information	Legibility
The proportions of the A series are 1:1.414	Three columns are appropriate for a poster whether landscape or portrait orientation. Four is permissible	Hierarchy of information is the logical arrangement of information from major section headings, followed by points under the section followed by examples	Key information should be visible from five meters
The diagonal is important because it allows the establishment of proportional sizing	The number of words per column should be between 6-9 to ensure readability	Use sans serif fonts for headings and serif fonts for text to aid readability	Too much information results in reader overload
The 1:1.414 is important for images because they can be set to the same proportions	The balance of text and visuals should not exceed 50:50 and generally there should be less visual material than text	Erratic use of columns destroys design balance and logical layout	Left justified is best for text because it promotes readability
	Deepening the bottom margin allows for focusing reader attention on material in the body of the poster	Images must relate to and enhance the text Too many things on a page can confuse the reader	Background color is important because it should not obscure key information It is difficult to read text printed over photographs or dense backgrounds The goal is to make sure that the message can be communicated
	The limits for characters per line are 45-70 characters including spaces	Referencing sources is essential	Excessive use of color is counter-productive to ensuring a clear message

Advice
Start early - The more drafts the better the final poster will become
Learn from good examples (see **Appendix 3**)

APPENDIX 2

Table 1 Poster Design Features

Order of speakers	Student I.D.	Name	Final Mark
1			
2			
3			
4			

Title of EMDP _____

ENG207 Section _____ Professor's Name _____

Content (same mark across team)

1 2 3 4 (*½marks acceptable)*

1 = The content lacks focus, indicates weak understanding of topic, shows lack of supporting evidence and is poorly organized and/or inadequately referenced

4 = Content is well focused, indicates comprehensive understanding of topic, well supported by evidence, organized in a logical and cohesive manner (SPSE), appropriately referenced

Visual Display (same mark across team)

1 2 3 4 (*½ marks acceptable)*

1 = confusing layout, little logical grouping of information, text/visuals relationship unclear, inappropriate use of colour, font choice inappropriate for engineering poster
4 = systematic layout and grouping of information, visuals enhance text, colour and font use appropriate

Oral Explanation (individual mark) (*½ marks acceptable)*

Speaker #1	1	2	3	4
Speaker #2	1	2	3	4
Speaker #3	1	2	3	4
Speaker #4	1	2	3	4

1 = hesitant and unclear, poorly structured, unable to mark significant information, intrusive errors that impede understanding, inappropriate language use, poor/no response to questions
4 = fluent, logically structured delivery with clear use of markers to highlight important information, appropriate language use, few if any errors, clearly engages questions

Comment:

Assessor:

APPENDIX 3[1]

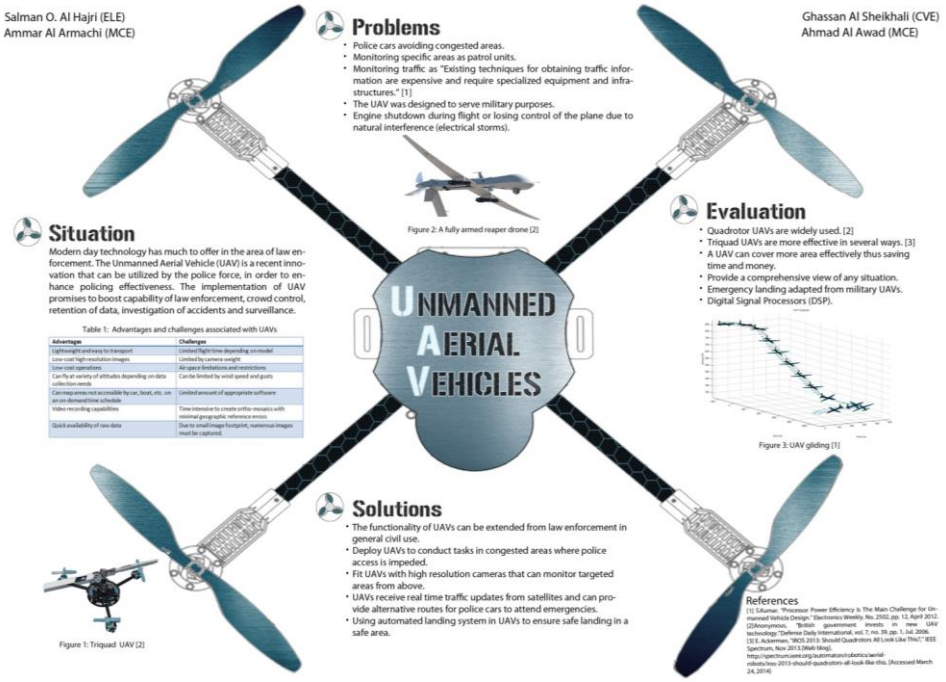

Fig. 1

[1] The authors would like to thank AUS interim provost, Kevin Mitchell, for giving us permission to include some of his ideas covered in his poster presentation lecture in this paper.

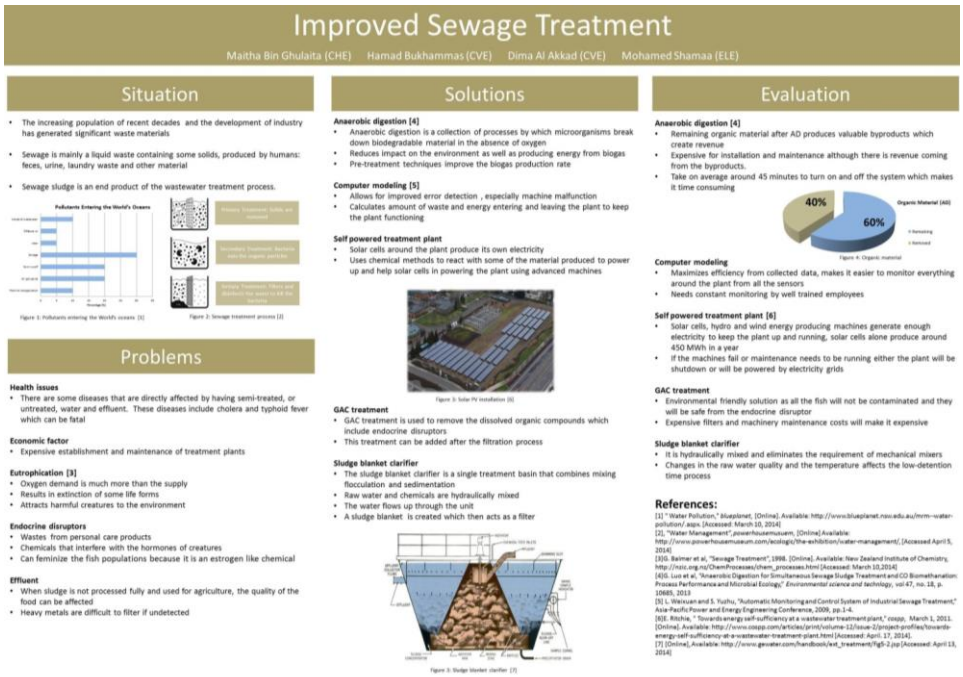
Improved Sewage Treatment
Maitha Bin Ghulaita (CHE) Hamad Bukhammas (CVE) Dima Al Akkad (CVE) Mohamed Shamaa (ELE)
Situation
The increasing population of recent decades and the development of industry has generated significant waste materials
Sewage is mainly a liquid waste containing some solids, produced by humans: feces, urine, laundry waste and other material
Sewage sludge is an end product of the wastewater treatment process.
Pollutants Entering the World's Oceans
Figure 1: Pollutants entering the World's oceans [1]
Figure 2: Sewage treatment process [2]
Problems
Health issues
There are some diseases that are directly affected by having semi-treated, or untreated, water and effluent. These diseases include cholera and typhoid fever which can be fatal
Economic factor
Expensive establishment and maintenance of treatment plants
Eutrophication [3]
Oxygen demand is much more than the supply
Results in extinction of some life forms
Attracts harmful creatures to the environment
Endocrine disruptors
Wastes from personal care products
Chemicals that interfere with the hormones of creatures
Can feminize the fish populations because it is an estrogen like chemical
Effluent
When sludge is not processed fully and used for agriculture, the quality of the food can be affected
Heavy metals are difficult to filter if undetected
Solutions
Anaerobic digestion [4]
Anaerobic digestion is a collection of processes by which microorganisms break down biodegradable material in the absence of oxygen
Reduces impact on the environment as well as producing energy from biogas
Pre-treatment techniques improve the biogas production rate
Computer modeling [5]
Allows for improved error detection , especially machine malfunction
Calculates amount of waste and energy entering and leaving the plant to keep the plant functioning
Self powered treatment plant
Solar cells around the plant produce its own electricity
Uses chemical methods to react with some of the material produced to power up and help solar cells in powering the plant using advanced machines
Figure 3: Solar PV installation [6]
GAC treatment
GAC treatment is used to remove the dissolved organic compounds which include endocrine disruptors
This treatment can be added after the filtration process
Sludge blanket clarifier
The sludge blanket clarifier is a single treatment basin that combines mixing flocculation and sedimentation
Raw water and chemicals are hydraulically mixed
The water flows up through the unit
A sludge blanket is created which then acts as a filter
Figure 3: Sludge blanket clarifier [7]
Evaluation
Anaerobic digestion [4]
Remaining organic material after AD produces valuable byproducts which create revenue
Expensive for installation and maintenance although there is revenue coming from the byproducts.
Take on average around 45 minutes to turn on and off the system which makes it time consuming
40%
60%
Organic Material (AD)
Figure 4: Organic material
Computer modeling
Maximizes efficiency from collected data, makes it easier to monitor everything around the plant from all the sensors
Needs constant monitoring by well trained employees
Self powered treatment plant [6]
Solar cells, hydro and wind energy producing machines generate enough electricity to keep the plant up and running, solar cells alone produce around 450 MWh in a year
If the machines fail or maintenance needs to be running either the plant will be shutdown or will be powered by electricity grids
GAC treatment
Environmental friendly solution as all the fish will not be contaminated and they will be safe from the endocrine disruptor
Expensive filters and machinery maintenance costs will make it expensive
Sludge blanket clarifier
It is hydraulically mixed and eliminates the requirement of mechanical mixers
Changes in the raw water quality and the temperature affects the low-detention time process
References:

Fig. 2

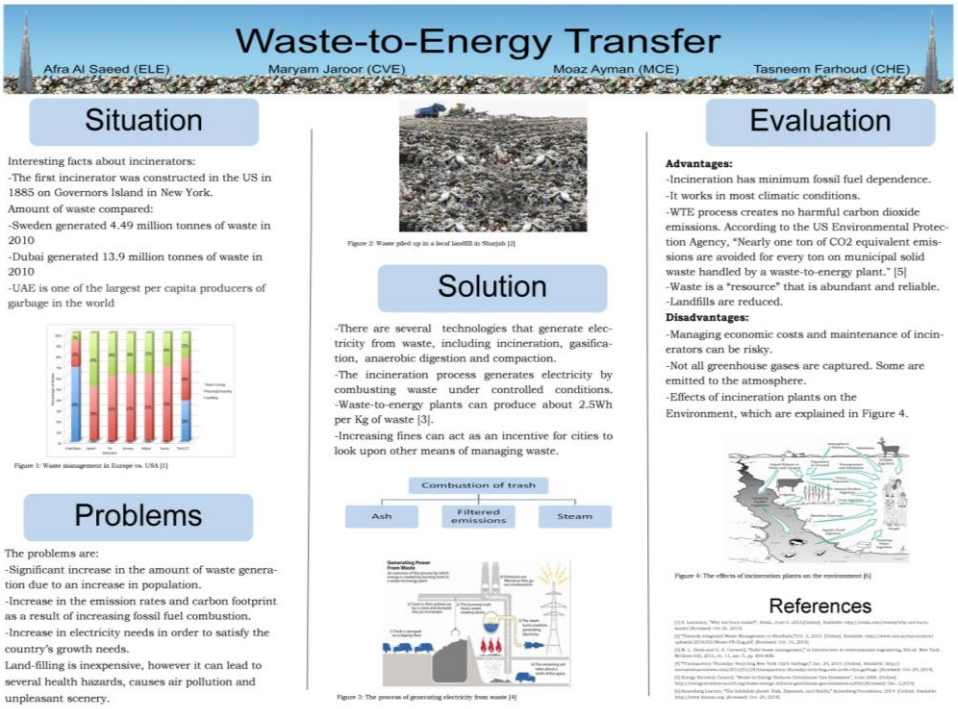
Waste-to-Energy Transfer
Afra Al Saeed (ELE)
Maryam Jaroor (CVE)
Moaz Ayman (MCE)
Tasneem Farhoud (CHE)
Situation
Interesting facts about incinerators:
-The first incinerator was constructed in the US in 1885 on Governors Island in New York.
Amount of waste compared:
-Sweden generated 4.49 million tonnes of waste in 2010
-Dubai generated 13.9 million tonnes of waste in 2010
-UAE is one of the largest per capita producers of garbage in the world
Figure 1: Waste management in Europe vs. USA [1]
Problems
The problems are:
-Significant increase in the amount of waste generation due to an increase in population.
-Increase in the emission rates and carbon footprint as a result of increasing fossil fuel combustion.
-Increase in electricity needs in order to satisfy the country's growth needs.
Land-filling is inexpensive, however it can lead to several health hazards, causes air pollution and unpleasant scenery.
Figure 2: Waste piled up in a local landfill in Sharjah [2]
Solution
-There are several technologies that generate electricity from waste, including incineration, gasification, anaerobic digestion and compaction.
-The incineration process generates electricity by combusting waste under controlled conditions.
-Waste-to-energy plants can produce about 2.5Wh per Kg of waste [3].
-Increasing fines can act as an incentive for cities to look upon other means of managing waste.
Combustion of trash
Ash
Filtered emissions
Steam
Figure 3: The process of generating electricity from waste [4]
Evaluation
Advantages:
-Incineration has minimum fossil fuel dependence.
-It works in most climatic conditions.
-WTE process creates no harmful carbon dioxide emissions. According to the US Environmental Protection Agency, "Nearly one ton of CO2 equivalent emissions are avoided for every ton on municipal solid waste handled by a waste-to-energy plant." [5]
-Waste is a "resource" that is abundant and reliable.
-Landfills are reduced.
Disadvantages:
-Managing economic costs and maintenance of incinerators can be risky.
-Not all greenhouse gases are captured. Some are emitted to the atmosphere.
-Effects of incineration plants on the Environment, which are explained in Figure 4.
Figure 4: The effects of incineration plants on the environment [6]
References

Fig. 3