



Exploring the Most Efficient Mapping Techniques and Platform to Map Sustainable Development Goals (SDGs)

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Abstract

Curriculum mapping is a common practice performed by higher education institutions in order to index the desired learning outcomes of courses, identify gaps and improve the delivery and content of the course. Sustainability has become an increasingly important factor for people and organisations to have in-depth knowledge of and should strive to become more sustainable; at the very least gain a greater understanding of developments around sustainability such as the United Nation's Sustainable Development Goals. The aim of this report is to explore how SDGs can be better implemented into courses across a university curriculum, how best curriculums can be mapped and evaluated with different software and to assess the possible integration of generative AI as a tool to assist with the mapping process. The exploration of literature explored the foundations of curriculum mapping for what should always be considered when performing a review as well as the reasons for performing one. The multiple mapping software explored all showed to be valuable tools that would all be similarly efficient, specific features should be evaluated for if they are useful in assessing the integration of SDGs. Tests ran with artificial intelligence as a tool to assist with curriculum mapping had some promising results as it was able to accurately understand the criteria provided and analyse the module descriptions on the website provided with very little errors. The findings of this research give make clear what should be considered when performing a curriculum review and most useful software available to perform a review. Additionally, the results from this report indicate a strong case for AI, specifically Chat-GPT-4o, to be integrated into curriculum mapping practices in the future due to the amount of time that has to be dedicated to curriculum mapping and Chat-GPT-4o's ability to analyse text can reduce the time necessary to perform a curriculum map or review as long as precautions are put in place to account for any errors the AI may produce.

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Introduction

The motivation behind this report is to assess the most effective way of curriculum mapping for higher education institutions (HEI) across the UK, particularly to comply with the United Nations (UN) Sustainable development Goals (SDG). SDGs are 17 goals adopted by all members of the United Nations with the intention to create “peace and prosperity for people and the planet” (United Nations, 2015). Higher education institutions such as the University of Leeds are therefore responsible for cultivating a generation sensitive to these international issues and ensuring their curriculums foster an understanding of these goals as well as showing their importance in future leaders. Sustainability has increasingly become an unneglectable issue that must be addressed in both corporations taking action to increase sustainability around their own operations and HEI tailoring their educational objectives to increase understanding of SDGs and sustainability in a global context.

Curriculum mapping is the process of indexing a curriculum primarily to identify academic redundancies or gaps within the course to be used to improve the courses effectiveness (Rawle et al., 2017). Curriculum mapping has become an increasingly necessary part of the modern education system with Ervin et al (2013) writing that there was a lack of literature covering the processes and noting that these processes should be better documented. By having a broader amount of literature to draw upon tools for curriculum mapping can be better designed to make curriculum mapping more efficient as the content necessary to deliver to students rapidly changes.

This report has looked at various research papers on curriculum mapping and assessed other HEI methods of mapping to be able to build a roadmap for how HEI’s could effectively evaluate their own curriculums and alter them to comply with the UN’s SDGs. Additionally primary research was carried out on the viability of generative AI as a tool for assessment of the University of Leeds curriculum.

The next section of this paper is the literature review conducted over 2-weeks that looked at the various methods for curriculum mapping and research papers on the subject. The methodology for how primary research on AI as a tool for curriculum mapping starts at page 6.

Aim and Objectives

The goal of this research report is to give a review of current literature on the most modern curriculum mapping methods as well as software used for mapping, the results of which can be used as a guideline for HEIs to use either when selecting their own method of curriculum mapping or developing their own tool internally. These tools should ideally also have

applicability to be able to assist with the evaluation of modules for the integration of sustainable development goals. A secondary objective was to assess the applicability of generative artificial intelligence as a tool for the assessment of a curriculum's integration of SDGs and as a way to automate the process of reviewing module descriptions.

Literature review

There is much published literature on curriculum mapping as the process has been refined over years. However, while the initial principles of curriculum mapping relating to the reasoning for curriculum mapping and the initial approach are unchanging methods through which curriculum mapping can be performed has radically changed over the past decade. A key conclusion from Ervin et al., 2013 is that as of the year of publication (2013) there was a clear lack of literature on mapping processes, this report does note that it did focus on the public health area. Since 2013 more publications have been made regarding effective curriculum mapping

Archambault and Masunaga (2015) covers the development of curriculum mapping from the 1980s and should be viewed as a method for developing an interdisciplinary curriculum across the entire institution, based on what is truly occurring in the classroom. Four phases were listed in the curriculum mapping process:

1. Establishing a foundation gaining an understanding of the reason for the institution to map
2. Initiating the process by organising the structure of the mapping
3. Maintaining, sustaining and integrating the system
4. Advanced mapping tasks for the future

A description by Archambault and Masunaga (2015) about primary and secondary education is still applicable to mapping in the modern day. With each professor often having very little understanding of what occurs in each other's classroom. Curriculum mapping should be a repeated process that occurs regularly in order to continuously refine and update the syllabus in order to keep University courses relevant. This becomes incredibly relevant when relating to the implementation of SDGs into the university curriculum as developments occur so often around sustainability maintaining a curriculum that is relevant to the current global climate is vital and should be a high priority when implementing the SDGs initially.

Many curricula mapping tools exist with a range of various benefits and drawbacks to each. Two of them assessed within this report, i.e., Coursetune and Sofia, where the Coursetune had

been primarily considered as a potential tool for curriculum mapping within the University of Leeds. Much of the software was useful as it could clearly display the course information as a visual map with only minor differences coming in the form of terminology such as units being equivalent to syllabus (University of Leeds, 2023). Dede et al., (2018, p6) described the benefits of using Coursetune as the Harvard Division of Continuing Education (DCE) is “unwilling to sacrifice the faculty-driven and flexible design of courses to simplify learning engineering” the software was specifically being used to address this limitation. Coursetune is able to provide a “highly structured description of the course” and is able to quantify the efficacy of approaches.

One factor highlighted as a possible issue is that Coursetune only performs its search for the exact phrase given to it, this becomes an issue if terms such as ‘econom’ are used or plural or past tense versions, the software may fail to recognise the request and produce a misleading result.

Sofia is another powerful mapping software developed by Imperial College Medical School in 2014 as no pre-existing software met the needs of the institution (Imperial College London, 2014). Key features Sofia has is giving administrators and teaching staff a clear overview and deep insight, additionally the system is accessible to students allowing them to easily track learning outcomes and better understand their curriculum by transparently linking learning outcomes to curriculum content. Sofia also has consultants that have a complete understanding of the software allowing for any misapprehensions to be resolved. In much the same vein as Coursetune, Sofia has the ability to display a detailed map of the curriculum and a “valuable tool when it comes to curriculum review” (Imperial College Medical School, 2018)

A curriculum mapping exercise by the University of Edinburgh (UoE) (Reid, 2020) is a sample work conducted over 12 months, in which its goals were to review the undergraduate and postgraduate syllabus’ at a selected trial school, identified courses that engaged with SDG’s, share the methods and result to establish a base for further research/review and connect staff, students and academic faculty to support further dissemination of the SDG’s at UoE. All of the objectives were met within the duration of the review.

The results of the report described their method as each course description taking 15 minutes to review on average meaning a ~400 course curriculum took 110 hours to review in total or 2 full-day sessions for 10 people to allow for quality checks. Non-anonymised surveys were sent out to course organisers in order to get the input of staff members who deliver the course this was done to get a greater understanding of the ‘intended curriculum’ in comparison to the ‘delivered curriculum’. This addresses one of the points listed by Hayes Jacobs being that only the professor understands what occurs in their classes and therefore their opinion is of vital

importance when trying to make changes to the curriculum. Additionally, information can be confirmed such as if the SDG involvement found from the course description was accurate to what was delivered.

The results of this literature review have shown what must be considered prior to undertaking a curriculum map/review, ensuring that adjustments are being made in order to improve the course. Securing accreditation from a organisation would be one way to ensure the changes do improve a courses integration of SDG's. Coursetune has proved to be a useful tool when assessed by both the University of Leeds from internal documentation, and Harvard Universities DCE, many of its features allow for flexible approaches to aid curriculum mapping as well as contain functions that could be replicated and used in a new curriculum software. Literature on Sofia was scarce, however information that was available demonstrated as a tool equally as capable as Coursetune. These tools should be taken into consideration and used as a standard for what mapping software should be capable of, in addition to the research on chatbots later in this report, the research conducted could aid in the development of new software which can utilise the strengths of refined mapping techniques with generative AI.

Methodology

While reviewing literature it became apparent that curriculum mapping is both labour and time intensive therefore the exploration of tools that could be used in order to aid in the mapping process and possibly cut down on the time required to conduct a map or review. The recent breakthroughs with AI have lead to it now becoming a versatile tool able to comprehend complex prompts, it was therefore explored to see if it was applicable to curriculum mapping. it was tested if it could be effective tool in assessing the modules in the University of Leeds trail school (the business school) level of integration of the UN's SDGs. ChatGPT was considered early in preparation for this research due to it being the AI most other bots are build off of as well as sources demonstrating it's the most powerful AI developing the most rapidly (O'Leary, 2023).

This was done by providing the AI with two sets of criteria with which it could assess each module description, one was split into different levels and presented as shown below:

- **Level 0 (UNRELATED):** No coverage of SDGs.
- **Level 1 (BRIEF MENTION):** SDG is mentioned briefly in the teaching, possibly through the lens of the specific subject but not explicitly framed as an SDG.
- **Level 2 (SUBJECT-SPECIFIC):** Integration into the module teaching content and application, but not a core topic. This level offers an understanding of an SDG or SDGs through the lens of the specific field.
- **Level 3 (INTERDISCIPLINARITY):** Embedded into the core teaching content; framed in an interdisciplinary and holistic context and used to address at least one SDG. This level shows interrelations between SDGs and crosses disciplinary boundaries.

The AI was then provided with a second set of criteria taken from the university of Edinburgh's methodology (Reid, 2020) which were terms relating to each SDG given below:

- **Goal 1:** No poverty – poverty, income distribution, wealth distribution, socioeconomic
- **Goal 2:** Zero Hunger – agriculture, food, insecurity, nutrition
- **Goal 3:** Good health and well-being – well-being
- **Goal 4:** Quality Education – educat, inclusive, equitable
- **Goal 5:** Gender equality – gender, women, equality, inequality, girl, queer
- **Goal 6:** Clean water and sanitation – water, sanitation
- **Goal 7:** Affordable and clean energy – energy, renewable, wind, solar, geothermal, hydroelectric
- **Goal 8:** Decent work and economic growth – econom, economic growth, sustainable development, labour, worker, circular econom, wage
- **Goal 9:** Industry, innovation and infrastructure – infrastructure, innovation, industr, buildings
- **Goal 10:** Reduced inequalities – trade, inequality, financial market, taxation
- **Goal 11:** Sustainable cities and communities – cities, urban, resilien, rural
- **Goal 12:** Responsible consumption and production – consum, production, waste, natural resource, recycl, industrial ecology, sustainable design
- **Goal 13:** Climate action – climat, greenhouse, greenhouse gas, environment, global warming, carbon, weather, climate crisis
- **Goal 14:** Life below water – ocean, marine, water, pollut, conserv, fish
- **Goal 15:** Life on land – forest, biodiversity, ecology, pollut, conserv, land use
- **Goal 16:** Peace, justice and strong institutions – institution, justice, governance, peace, rights

Goal 17 was excluded from the prompt given as the search terms were taken from the University of Edinburgh's methodology.

AI-based tools for module content mapping

Chat-GPT-4o, GPT-4 and Microsoft co-pilot were used in the research in order to evaluate AI's effectiveness at being able to be presented with criteria which it could follow and accurately evaluate each individual modules inclusion of SDGs alone with justifications for its conclusions. Chat-GPT has access to the internet and should theoretically be able to analyse the module description available on the Leeds University website and provide a justified response to the prompt. Issues that could arise may relate to security as confidential documents not available on the internet should not be given to Chat-GPT as it saves all user inputs.

GPT-4 is the free version of Chat-GPT and was trialled first. It was provided with a small criterion of terms from the UoE's list and provided a link to the University of Leeds business school module list but was unable to provide an analysis for any of the modules and provided instructions for how best the prompter could do it themselves. Despite multiple attempts the trials with GPT-4 were unable to produce the intended results.

The first test with Chat-GPT-4 went as shown below:

Prompt: 'Access this webpage: Does the description of the module principles of international business mention the terms "poverty" "income distribution" "wealth distribution" "socio-economic" "no poverty" search this link: <https://webprod3.leeds.ac.uk/catalogue/dynmodules.asp?Y=202425&M=LUBS-1140>'

Response from Chat-GPT 4: I'm unable to directly access or browse webpages in real-time. However, I can provide guidance on how to search for specific information on the webpage you've mentioned.

To find out if the module "Principles of International Business" at Leeds University mentions the terms you're interested in, you can follow these steps:

1. **Visit the webpage:** Go to the link you provided: [Leeds University Module Catalogue](<https://webprod3.leeds.ac.uk/catalogue/dynmodules.asp?Y=202425&M=LUBS-1140>).
2. **Search the page:** Once on the page, use your browser's search function (typically Ctrl+F or Command+F) to search for each term:
 - Type "poverty" and hit Enter to see if it appears on the page.
 - Repeat this process for "income distribution", "wealth distribution", "socio-economic", and "no poverty".
3. **Review the content:** Check the context in which these terms appear to understand how they are discussed within the module.

By following these steps, you should be able to determine whether these specific terms are mentioned in the module description for "Principles of International Business" at Leeds University. If you have any more questions or need further assistance, feel free to ask!

GPT-4o, the version requiring a paid subscription to access, was provided the single list of criteria split into four levels. GPT-4o was able to complete my request beside one error, due to the character limit found to be 4,096 it was unable to analyse all modules in the University of Leeds Module and Programme catalogue and ceased its analysis after 6 modules had been analysed.

The test with Chat-GPT 4o is shown below:

Prompt: Here is the criteria for how courses are to be evaluated. Please access this link and evaluate each module based on the description:
<https://webprod3.leeds.ac.uk/catalogue/modulesearch.asp?L=UG&Y=202425&E=all&N=LUBS&S=&A=any>

0: UNRELATED No coverage

1: BRIEF MENTION SDG is mentioned briefly in the teaching. SDG discussed through the lens of civil engineering only. The SDG theme/challenge might or might not be referenced in the context of the SDG framework.

2: SUBJECT-SPECIFIC Integration into the module teaching content and application but it's not a core topic of the module. Typically, this offers understanding of an SDG or SDGs through the lens of one's specific field. This would explicitly reference the SDG theme/challenge as an SDG.

3: INTERDISCIPLINARITY Embedded into the core teaching content; framed in an interdisciplinary and holistic context and used to address at least one SDG. Teaching crosses disciplinary boundaries of civil engineering and/or shows interrelations between SDGs. *This would explicitly reference the SDG theme/challenge as an SDG.

Response from Chat-GPT 4o: I evaluated six modules from Leeds University Business School based on the provided criteria for sustainability teaching:

1. LUBS0010 Foundations of Economics:

- Criteria Level: 0 (UNRELATED)
- Reason: The module focuses on micro and macroeconomic concepts, theories, and institutions without specific mention of sustainability or SDGs in the syllabus.

2. LUBS0030 Introduction to Marketing:

- Criteria Level: 0 (UNRELATED)
- Reason: This module covers marketing theory, research, and strategies but does not reference sustainability or SDGs in its objectives or content.

3. LUBS0040 Introductory Accounting and Finance:

- Criteria Level: 0 (UNRELATED)
- Reason: The content revolves around fundamental accounting and finance principles and techniques without integration of sustainability topics.

4. LUBS0050 Introduction to International Business:

- Criteria Level: 2 (SUBJECT-SPECIFIC)
- Reason: This module mentions critical issues like globalization, the rise of emerging economies, and sustainable development, indicating a subject-specific integration of SDG themes.

5. LUBS0060 Introduction to HRM:

- Criteria Level: 1 (BRIEF MENTION)
- Reason: The module includes recent developments in HR practice and the management of diversity, but only briefly touches on sustainability.

6. LUBS0070 Introductory Management:

- Criteria Level: 0 (UNRELATED)
- Reason: The focus is on management theories, functions, and organizational structures without addressing sustainability or SDGs.

These evaluations suggest that sustainability is not a core focus in most of these introductory modules, with only one course integrating sustainability at a subject-specific level. For a more comprehensive integration of sustainability, it may be beneficial to embed these concepts across more modules and ensure they are part of the core teaching content.

For detailed information on each module, you can refer to the [University of Leeds Module Catalogue](#).

Following the success of GPT-4o responding to the prompt, it was then provided with the additional set of criteria listed in the previous section with the intention for it to use both criteria simultaneously when evaluating the module descriptions. When asked how it assessed a second set of modules it was able to accurately regenerate both sets of criteria it had been instructed to use.

Prompt: Chat-GPT what criteria did you use to assess these modules?

Response from Chat-GPT 4o: To assess the modules from the University of Leeds Business School for the integration of Sustainable Development Goals (SDGs), I used the following criteria and search terms based on the provided guidelines:

Criteria for Evaluation

1. Level 0 (UNRELATED): No coverage of SDGs.
2. Level 1 (BRIEF MENTION): SDG is mentioned briefly in the teaching, possibly through the lens of the specific subject but not explicitly framed as an SDG.
3. Level 2 (SUBJECT-SPECIFIC): Integration into the module teaching content and application, but not a core topic. This level offers an understanding of an SDG or SDGs through the lens of the specific field.
4. Level 3 (INTERDISCIPLINARITY): Embedded into the core teaching content; framed in an interdisciplinary and holistic context and used to address at least one SDG. This level shows interrelations between SDGs and crosses disciplinary boundaries.

Search Terms for SDGs

- Goal 1: No poverty – poverty, income distribution, wealth distribution, socioeconomic
- Goal 2: Zero Hunger – agriculture, food, insecurity, nutrition
- Goal 3: Good health and well-being – well-being
- Goal 4: Quality Education – educat, inclusive, equitable
- Goal 5: Gender equality – gender, women, equality, inequality, girl, queer
- Goal 6: Clean water and sanitation – water, sanitation
- Goal 7: Affordable and clean energy – energy, renewable, wind, solar, geothermal, hydroelectric
- Goal 8: Decent work and economic growth – econom, economic growth, sustainable development, labour, worker, circular econom, wage
- Goal 9: Industry, innovation and infrastructure – infrastructure, innovation, industr, buildings
- Goal 10: Reduced inequalities – trade, inequality, financial market, taxation
- Goal 11: Sustainable cities and communities – cities, urban, resilien, rural
- Goal 12: Responsible consumption and production – consum, production, waste, natural resource, recycl, industrial ecology, sustainable design
- Goal 13: Climate action – climat, greenhouse, greenhouse gas, environment, global warming, carbon, weather, climate crisis

- Goal 14: Life below water – ocean, marine, water, pollut, conserv, fish
- Goal 15: Life on land – forest, biodiversity, ecology, pollut, conserv, land use
- Goal 16: Peace, justice and strong institutions – institution, justice, governance, peace, rights

Evaluation Process

1. Extract Text: For each module, I extracted the module description, objectives, learning outcomes, syllabus, and any other relevant details.
2. Search for Terms: I searched for the presence of the specified SDG terms within the module content.
3. Categorize: Based on the presence and context of these terms, I categorized each module according to the levels outlined above.

Example Module Assessments

- LUBS1925 Introduction to Management Accounting:

- Level: 0 (UNRELATED)

- Reason: The module description and syllabus focus on management accounting principles without mentioning any SDG-related terms.

- LUBS1940 Economics for Management:

- Level: 2 (SUBJECT-SPECIFIC)

- Reason: Includes topics such as economic growth and unemployment, aligning with SDG 8 and SDG 10, though these are not the core focus.

- LUBS2000 Management, Work and Organisations:

- Level: 1 (BRIEF MENTION)

- Reason: The module includes discussions on gender and ethnic entrepreneurship, relating to SDG 5 and SDG 10, but not as a central theme.

By using these criteria and terms, I evaluated each module to determine how well they integrate sustainability concepts and SDGs into their content.

The responses provided by Chat-GPT were incredibly useful, however an understanding of the quantity of modules it could process accurately at once was unclear and was important to understand in order to gain a greater understanding of how useful AI would be for curriculum mapping. Chat-GPT was provided with another prompt to analyse all modules which yielded a result where Chat-GPT categorised 20 modules in different levels however it did not apply reasoning for each module and the accuracy diminished as one module was wrongly placed in three levels. In order to avoid the accuracy of Chat-GPTs analyses from dropping, a maximum of 6 modules should be analysed at once to get an in-depth analysis of modules without reducing the information Chat-GPT provides justifying its analysis.

Prompt: Chat-GPT, can you analyse all the modules in the business school?

Response from Chat-GPT 4o: I have evaluated the modules in the Leeds University Business School based on your criteria for sustainability integration. Here is a summary of the findings for each module category:

1. Modules with No Coverage of Sustainability (Level 0: UNRELATED)

- LUBS0010 Foundations of Economics
- LUBS0030 Introduction to Marketing
- LUBS0040 Introductory Accounting and Finance
- LUBS0070 Introductory Management
- LUBS1035 Foundations of Finance
- LUBS1036 Introduction to Finance
- LUBS1037 Foundations of Banking
- LUBS1055 Academic and Professional Development for Studies in Finance
- LUBS2001 Mathematics and Statistics for Economics and Business
- LUBS2002 Further Mathematics and Statistics for Economics and Business
- LUBS2005 Microeconomic Theory
- LUBS2006 Macroeconomic Theory
- LUBS2009 Behavioural Economics
- LUBS2010 Environmental Economics

2. Modules with Brief Mention of Sustainability (Level 1: BRIEF MENTION)

- LUBS1001 Introduction to Enterprise and Entrepreneurship
 - Briefly touches on the role of entrepreneurship in addressing environmental issues through innovation.
- LUBS1055 Academic and Professional Development for Studies in Finance
 - Includes a brief mention of why and how businesses embrace sustainability.
- LUBS2001 Social Enterprises and Sustainable Development
 - Provides an overview of the role of social enterprises in addressing social and environmental issues, aligning with SDG themes.

3. Modules with Subject-Specific Integration of Sustainability (Level 2: SUBJECT-SPECIFIC)

- LUBS2001 Social Enterprises and Sustainable Development
 - Focuses on social enterprises addressing a range of social and environmental issues, explicitly referencing SDG themes and challenges.
- LUBS2002 Corporate Social Responsibility and Sustainability
 - Explores the role of CSR in modern businesses, with a specific focus on sustainability practices and their impact on business operations.

4. Modules with Interdisciplinary Integration of Sustainability (Level 3: INTERDISCIPLINARITY)

- LUBS2001 Social Enterprises and Sustainable Development

- Provides a comprehensive, interdisciplinary approach to understanding social enterprises and their impact on social and environmental challenges, directly aligning with multiple SDGs.

Summary

While most modules do not explicitly integrate sustainability into their core content, a few do mention it briefly, and some provide subject-specific or interdisciplinary approaches. For a more comprehensive sustainability education, it would be beneficial for the Business School to embed sustainability concepts across a wider range of modules, ensuring they are a core part of the curriculum.

For more detailed information on each module, you can refer to the [University of Leeds Module Catalogue](<https://webprod3.leeds.ac.uk/catalogue/modulesearch.asp?L=UG&Y=202425&E=all&N=LUBS&S=&A=any>).

Microsoft co-pilot was used as an attempt to repeat the results generated by GPT-4o in order to ensure the result repeatability with different generative AI. While co-pilot proved difficult to comprehend the prompt given to the same extent as GPT-4o it was still able to access the University of Leeds Business School module catalogue however it did not provide a module code to easily identify the module it had analysed additionally the module titles it had given were a close but not exact match to the modules in the Business School and no module title resembled the one listed as “Environmental Engineering Practices”. From this test it is revealed that Copilot answers were totally inaccurate and the module titles did not match any in the business school or wider university curriculum.

Prompt: Evaluate 3 modules for me, using the criteria provided

Response from Copilot: Certainly! Let's evaluate all the modules based on the provided criteria:

1. **Introduction to Sustainable Development:**

- **Level:** Interdisciplinarity (Level 3)
- **Description:** This module provides a comprehensive overview of sustainable development, addressing multiple SDGs. It explores interdisciplinary connections and emphasizes holistic approaches.

2. **Environmental Engineering Practices:**

- **Level:** Subject-Specific (Level 2)
- **Description:** In this module, sustainable practices related to environmental engineering are covered. While SDGs are integrated, they are not the central focus.

3. **Business Ethics and Social Responsibility:**

- **Level:** Brief Mention (Level 1)

- **Description:** This module briefly touches upon SDGs within the context of business ethics and social responsibility. However, it does not delve deeply into specific SDGs.
-

These evaluations are based on the provided descriptions, and actual course content may vary. This is a challenge to consider in using generative AI for mapping as the assumption in this research was that module catalogue is current and reflects the module content accurately.

Suggestions for Future Developments

When developing a software for curriculum mapping an understanding of what current products exist, of those that exist which are most often used and why? Other factors to consider is the functionality; are some software objectively more efficient at curriculum mapping than others or are their aspects of one that are particularly exceptional such as Coursetune's 'term search' function. Regarding AI the HEI should decide its own approach towards the integration of AI within the institution and decide on the level of integration prior to undertaking any review to development, whether AI is integrated into the mapping software itself, just used as a tool to speed up the mapping process or left out entirely due to its occasional inaccuracies that is for the institution to decide. It should be noted that security should also be a factor but as of now there is nothing to suggest using Chat-GPT to access content freely accessible on the internet poses any security risks.

An all-purpose software is likely the best approach as assessing the integration of SDG's is a worthwhile but niche objective that over the next decade therefore the content of the course will have to change in order to match the changes in the global sustainability climate. Suggestions for further research would be to carry out a larger scale survey on the current mapping practices of multiple HEIs, this would allow for a thorough understanding of modern mapping practices and highlight institutions that are especially efficient in order to improve the institution own. Further research should be conducted regarding the use of AI for curriculum mapping specifically how much time it is able to save when integrated effectively as well as frequency and severity of errors that occur as well as exploring techniques that are able to significantly reduce frequency of errors.

Results and Discussions

The literature review gave valuable insight into the mapping process of HEIs as well as a thorough understanding of the many approaches and tools available to HEIs. Much of the information gathered from the literature review would be useful for any HEI to consider prior to carrying out an analysis of their current curriculum or developing a standard procedure for evaluating the learning outcomes of different modules.

The tests with Chat-GPT-4 were able to understand the given criteria and request but unable to analyse the module description itself when asked. GPT-4 was only able to provide a detailed suggest of how the prompter would carry out an evaluation themselves. Despite multiple attempts and re-phrasing the prompt to attempt to get a more desired result the AI was unable to provide a usable result.

The tests with the latest model of Chat-GPT-4o as of (9th August 2024) was given both complete criteria for which to evaluate the module descriptions. When prompted it was able to produce a list of 6 modules from the University of Leeds Business School module catalogue categorised in levels 0 to 3 with reasons for each level assigned. The modules Chat-GPT-4o analysed were then checked manually to see if its assessment was accurate; LUBS 1940 Economics for Management (University of Leeds, 2024) was assigned 'level 2 subject specific' by Chat-GPT due to its mention of economic growth and unemployment however this is to be expected from a module that focuses on the foundations of economics therefore measures such as surveys from the module leader would give the extent to which these topics are covered and to what extent in a sustainability context. Another module that was cross checked manually was LUBS 2000 Management, Work and Organisations (University of Leeds, 2024) it was assigned 'level 1 brief mention' for its coverage of ethical entrepreneurship and gender relating to SDG 5 and 10 but further checks with students and staff would be needed to verify the depth to which it is covered. Issues with Chat-GPT's analysis become apparent when asked to analyse all modules Chat-GPT could list 20 modules categorised between level 0 and 3, which was an increase from the initial 6 it had previously been able to list however less thorough descriptions were given for the reasoning of each module and the AI made an error including one module in levels 1, 2 and 3 providing different justifications in each level. Additionally, there proved to be no reliable way to analyse the modules in order without providing the list in the prompt.

Co-pilot was tested following the positive results with GPT-4o in order to see if the results could be replicated with different generative AIs. While it was able to successfully mimic the results of Chat-GPT-4o it took longer for co-pilot to comprehend and perform my exact request as I had to provide multiple different prompts but there is also a 30 prompt limit after which the user must refresh co-pilot, this will likely lead to much time consuming repletion of re-training the AI to understand the task and a much less efficient alternative to Chat-GPT-4o.

Conclusions and Recommendations

The assumption in this research was that all module catalogues are current and learning outcomes accurately reflect what is included in the module content. However, preparation must be carried out prior to commencing the curriculum mapping process ensuring that discrepancies such as the difference in the module description and what is taught in class is accounted for. The process for mapping used in UoE is useful as a benchmark for how long mapping processes should take when carried out manually.

The curriculum mapping software examined in this report were both versatile and flexible, for implementing a review of SDG integration, however the institution should determine what method of reviewing curricula is most effective for itself through thorough research of the software's strengths.

Tests with AI prove is a powerful tool that can be utilised to reduce the length of laborious tasks involved in curriculum mapping and as a tool to be used for analysis of module descriptions when provided with a clear criteria as for how the AI is to analyse the description it is given. However, the accuracy of AI has shown to vary, with it occasionally making slight errors in both its understanding of the prompts it is given and the results it produces in response therefore quality checks should be in place to ensure the AI is accurate with every analysis it undertakes. Chat-GPT is also currently limited to how many characters it can generate in response to a single prompt. When promoted about its own character limit it states it has a limit of 4,096 characters, therefore if used for analysis of large sets of data such as detailed module descriptions an approach should be undertake which allows for the maximum number of modules accurately assessed from each prompt, 6 appeared to be the limit during the time this research was carried out. Any attempt to analyse more than 6 modules at once resulted in less information justifying Chat-GPTs analysis and an increase in errors in the results it produced.

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Glossary

Chat-GPT-4 – standing for Generative Pre-trained Transformer 4 it was launched on 14th March 2023 and developed by OpenAI

Chat-GPT-4o – standing for Generative Pre-trained Transformer Omni was launched on 13th May 2024 and developed by OpenAI

Microsoft Copilot – a generative artificial intelligence chatbot developed by Microsoft launched in 2023