Incitement of Podcast Learning in Physics, A Social Network Investigation

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ABSTRACT

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The modern-day society, the fast development of the information technologies and the dynamics of the Internet use, have indeed imposed revolutionary changes in all the spheres of the society, including the education and teaching. In the context of Physics education, researchers are focusing on the implications of podcast learning in education. Though, in copious studies, the impact of podcast technology is investigated and reported. However, to the best of our knowledge, there is no study which has empirically investigated the podcast learning on teaching Physics and educational outcomes. We proposed a method to compute the user’s perceptions regarding podcast learning and its impact through social network analysis. Subsequently, we executed a case study on 50000 public tweets extracted from the Twitter social network. In this paper, our main contributions are related to the understanding of the public opinion and sentiments regarding podcast learning and its impact on the student’s outcomes. We observe 46% positive, 41.5% neutral and 12.5% negative comments to through sentiment analysis. The low value of negative comments indicates the agreement level of public regarding the correlation of podcast learning and its impact on student’s outcomes.

Keywords:
Podcast; Physics; Teaching; Student; Tweets.

1. Introduction

Podcasting phenomenon has shown tremendous development in the last few years. The United States Department of Education states that “technology infuses schoolroom environments with digital learning tools” [1]. Technology that is beginning to imbue classroom environments are podcasts. Podcasts are generally audio or video files that can be downloaded to computer and played. Podcasts have had a rapid rise in popularity in recent years. In 2014, there were 7 billion total Apple podcast downloads, 10.5 billion in 2016, 13.7 billion in 2018, and in March of 2018 Apple Podcasts jumped to 50 billion total podcast downloads and streams [2]. Locker (2018), also reveals that podcasts now cover over 155 countries, with at least 525,000 active podcast shows and more than 18.5 million episodes [2]. People are listening, and the growth is continuing. Due to the least technology requirements, the accessibility and availability of podcasts is extensive.

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We can listen to podcasts when commuting, exercising, or working. By the same perfunctory, podcast creation has never been easier, and everyone is allowed to participate. Podcasting in its current form, as a method of distributing audio content and digital recording which played on the digital media player. Usually, MP3 file are used for audio recording but other formats can also be used. Several devices are used to play these files such PC (Personal Computers), laptops and so on. Besides several sort of media players such as Window media players, iTunes and so on [3-7].

Recently, prompt escalation in the podcast users is reported due to variety in devices used to play the audio recording files. Such devices permit audio and video for listening and watching without any time or place constraints. Moreover, in the context of education, same devices can be used to delivered relevant material. Like other domains, in Physics education and in tele-physics, effective use of podcast has been reported. The interest of professional communities and Physics journals are producing numerous podcasts. However, due to blurred images and noises several podcast are immature and demand for high quality cameras and microphones. Research community has also empirically investigated that mostly podcasts are not designed to replace the traditional way of lectures. However, but these podcast can help student to provide online lectures which can be learn anywhere and any time with any pace. As compared to traditional learning, learning via podcast is more effective because it can enable a learner to understand in-class taught material by revising it several times. Evidence shows that teachers have been using podcasts as a learning resource at an increasing rate. For instance, the website “Teacher Pay Teachers (where teachers can purchase lesson plans from each other) saw an increase in downloads of plans related to podcasts in 2014 and 2015” [8-9]. Several practice points of podcast are reported such as 1) Its use for Physics students, 2) It is useful for exam revision, 3) its impact on student’s outcome and 4) It is available in certain formats [10-12]. In the context of Physics education, podcast are considered as an emerging area for institution, teachers and student. However, there is lack of study to show the public perception regarding the implementation of podcast and its impact on the student’s outcomes.

We address this issue and propose a methodology. The aim of propose methodology is to conduct an empirical study to compute the public perception regarding the use of podcast in Physics education and its impact on the student’s outcome. In order to achieve our propose objective, we formulated the following two research questions.

**Research Question 1 (RQ 1):** What is the public perception and opinion regarding the use of podcasts in Physics education?

**Research Question 2 (RQ 2):** What are the public concerns about podcasting in student’s outcomes?

The aim of RQ 1 is to investigate that how public is perceiving Podcasts in Physics education and what are their opinion. Similarly, the aim of RQ 2 is to investigate the impact of Podcast on students’ outcome via public perception.

In this paper, our main contribution are:

i. To design and implement a data crawler for twitter Application Programming Interfaces (API).
ii. To compute the public perception regarding podcast learning

The rest of the paper is organized as follows: In Section 2, we discussed some related work on the topic modeling and sentiment analysis. In section 3, we describe the proposed method. In section 4, we describe the experimental procedure. In section 5, we present the results. Finally, in section 6 and 7, we discuss the implications of the proposed method and conclusion respectively.
2. Methodology

The overview of proposed method is shown in Figure 1. This figure illustrates the phases of proposed approach. The main phases of the proposed approach are 1) data collection and pre-processing, 2) Sentiment Analysis, and 3) Data Visualization.

<table>
<thead>
<tr>
<th>Tweets</th>
<th>Data collection</th>
<th>Processing</th>
<th>Sentiment analysis</th>
<th>Data visualization</th>
</tr>
</thead>
</table>

**Figure 1:** Different phases for proposed approach

2.1 Data Acquisition and pre-processing

The first phase of proposed approach is responsible to crawl data for some queries. Table 1 shows the keywords for the Data Acquisition and pre-processing though tweets. Data is crawled from twitter Application-programming interfaces (API) [12-13].

<table>
<thead>
<tr>
<th>Keywords</th>
<th>Queries</th>
<th>No. of Tweets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Podcast and student’s outcomes</td>
<td>(#podcasts OR #podcasting) AND (#Education,#Physics)</td>
<td>50000</td>
</tr>
<tr>
<td></td>
<td>(#podcasts OR #podcasting) AND (#students,#treatment)</td>
<td></td>
</tr>
</tbody>
</table>

The retrieved data is unstructured and in the form like text, images, special characters and videos. Consequently, it needs some pre-processing steps to get the required format for further processing. We performed and recommend a set of activities in order to present data in structured form. The list of activities is as follows.

Step-1. All tweets have converted into lower case in order to make consistent text.
Step-2. The stop words have removed such as the, a and so on.
Step-3. Word stemming has applied using Poster’s algorithms to obtain stem word to reduce text noising.
Step-4. Emoticons and special symbols used in tweets have removed.
Step-5. URLs have removed as they were not helpful for getting the required results.
Step-6. We extracted the hashtag ‘#’ data, as this is a method to spread opinion and information all over the network publicly.
Finally, all processed data is stored in the database in structured form.
2.2 Sentiment Analysis

The second phase of the proposed approach is aid to perform the main roles. Initially, we used the pre-processed data for sentiment analysis to get the overall public perception about the keywords. Furthermore, we also analyzed the data distribution and investigated the nature of data using some statistical analysis. For sentimental analysis of podcast learning, the cleansed data was retrieved from database. Tags were assigned to each tweet based on their polarity. Tags can be positive, negative, or neutral. The positive tag means that the tweet is giving a positive opinion about the searched trend. The neutral tag means the tweet is not either expressing positive or negative opinion about the given trend.

2.3 Data Visualization

The aim of this phase was to present the analyzed results. Sentimental analysis results were visualized using bar graphs to show the overall public perception in some particular keyword. The graphs showed different aspects of public opinion.

2.4 Experimental Procedure

The main steps of our experiment was.

**Step-1.** We designed a crawler to retrieve data from multiple clients at the same time. We implemented it in Python language and collected data for podcast learning. The preprocessed data stored in NoSQL database in JSON format for fast processing.

**Step-2.** We performed sentiment analysis to identify the polarity of tweets. We used lexicon based sentimental approach to analyze the tweets polarity. WordNet was used for scoring the opinion words that how is the tweet positive, negative or neutral about the topic. Matplotlib package was used for visualizing all the graphs in python.

**Step-3.** We used bar charts to describe the results of sentiment analysis.

3. Results

3.1 Response to RQ-1

Sentiment analysis was performed in order to get the overall user perception on the podcast learning in Physics education. Figure 2 shows the retrieved user perception results. That is the distribution of public opinion regarding their sentiments towards the podcasting on student’s outcome. The results presented an interesting fact that almost equal percentage of the population has positive and neutral sentiments towards podcasting. That specified that a huge portion of the population is ignorant about the technology. They have not used or they never listened about this technology. That’s why they remain neutral about it.
3.2 Response to RQ-2
In order to get the public concerns about the use of podcasting in Physics was achieved using topic modelling. Topic modelling was applied to get the significant terms occurred in tweets corpus. Cloud representation was used to show the topics along with corresponding frequencies. In this figure, each some of the topic having fewer frequencies comparatively are missing kids, fake, explosive and failed etc. However, the positive topics or interests about podcasting are bleacher report, recover, and future etc.

4. Conclusions
In this paper, we proposed an approach via social network to compute user perception regarding podcast learning. We retrieved 50000 public tweets from Twitter regarding podcast learning. Subsequently, we performed sentiment analysis. The results 46% positive, 41.5% neutral and 12.5% negative comments indicate that huge portion of the population is ignorant about the technology. They have not used or they have never listened about this technology. That’s why they remain neutral about it. The public perception regarding new technologies can aid a decision maker of a domain expert to set the effective guidelines for the improvement. Recently, in terms of podcast learning, researchers have reported its implications on students learning and student’s outcomes.

References


