

# Learning dynamics in a cellular automata model of classroom interaction

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## Abstract

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Keywords: keyword 1, keyword 2

## 1 Introduction

This is the template for articles submitted to the Samahang Pisika ng Pilipinas Physics Congress. Using the included BibTeX template one can cite articles [1], arXiv preprints [2], books [3], and conference proceedings [4–6]. It is preferred to insert citations before punctuation [1, 2]. Sections, figures, and tables are referred to by the usual `\ref{...}` command (as seen in Section 1).

Use the equation environment

```
\begin{equation}\label{eq:law2}
\vec{F} = m \vec{a}.
\end{equation}
```

to display equations

$$\mathbf{F} = m\mathbf{a} + \nu\boldsymbol{\sigma}. \quad (1)$$

The `\bm` package allows the use of bold face Greek letters: `\bm{\sigma}`. Equations are referred in text by the command `\eqref{eq:law2}` as we do here (1). Longer equations may use the `align` environment

```
\begin{align}
\vec{F} &= \vec{F}_1 + \vec{F}_2 + \vec{F}_3 \nonumber \\
&\quad + \vec{F}_4 + \vec{F}_5 + \vec{F}_6 \nonumber \\
&\quad + \vec{F}_7 + \vec{F}_8 + \vec{F}_9.
\end{align}
```

to get

$$\begin{aligned} \mathbf{F} &= \mathbf{F}_1 + \mathbf{F}_2 + \mathbf{F}_3 \\ &\quad + \mathbf{F}_4 + \mathbf{F}_5 + \mathbf{F}_6 \\ &\quad + \mathbf{F}_7 + \mathbf{F}_8 + \mathbf{F}_9. \end{aligned} \quad (2)$$

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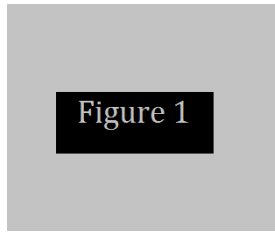


Figure 1: This is an example of a single column-wide figure. Figure captions are preferably self-contained and in vector format (versus raster format).

vel illum qui dolorem eum fugiat quo voluptas nulla pariatur? ed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrum exercitationem ullam ed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt.

## 2 Figures and tables

Figures are inserted into the document by the environment

```
\begin{figure}[tb]
  \centering
  \includegraphics[width = 0.3\linewidth]{figure1.pdf}
  \caption{...}\label{fig:plot1}
\end{figure}
```

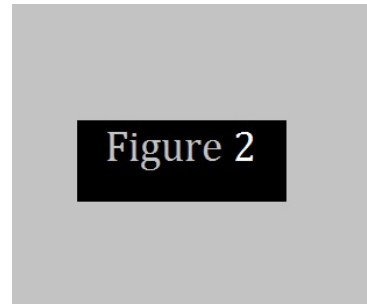
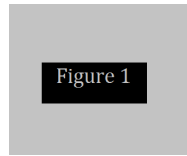
shows how to insert Figure 1. The option [tb] tells the compiler to place the figure at the top (first priority) or bottom (second priority) of the page. The figure can be scaled using the [width=...] option. Usually the width is specified as a fraction, (say 0.3) of \linewidth. This template can use \*.pdf, \*.png, \*.jpg figures.

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### 2.1 Subfigures

To save space, multiple subfigures may also be inserted as subfloats within a single figure environment, as in Figure 2. Here is the code:



(a) Optional subcaption of this subfigure.

Figure 2: Multiple images can be inserted inline.

```
\begin{figure}[tbp]
  \centering
  \subfloat{\makebox[0.4\textwidth]{\includegraphics{a.pdf}\label{fig:fa}}}{
  \quad % or other spacing between figures
  \subfloat{\makebox[0.4\textwidth]{\includegraphics{b.jpg}\label{fig:fb}}}{
  \caption{Multiple images can be inserted inline.}\label{fig:plots}
\end{figure}
```

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## 2.2 Tables

In the sample Table 1 the environment

```
\begin{table}
\centering
\caption{...}
\begin{tabular}{l c d{2.3} r}
  \toprule
  ... & ... & ... & ... \\
  \midrule
  ... & ... & ... & ... \\
  \bottomrule
\end{tabular}
\end{table}
```

constructs a four-column table with the first column left-aligned, second column centered, third column aligned on the decimal point with 2 integer digits and 3 decimal places, and the fourth column right-aligned. Ampersands & separate columns while double backslashes \\ start a new row.

Ed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta

Table 1: This is an example of a single column table. Captions are preferably self-contained and placed above the table. Columns may be left-, center-, decimal marker-, or right-aligned.

Example	Count 1	Count 2	Total
A	2.345	5.435	16.78(3)
B	3.0	12.0	43.2(5)

sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrum exercitationem ullam corporis suscipit laboriosam, nisi ut aliquid ex ea commodi consequatur? Quis autem vel eum iure reprehenderit qui in ea voluptate velit esse quam nihil molestiae consequatur, vel illum qui dolorem eum fugiat quo voluptas nulla pariatur?

### 3 Using BibTeX for the References

The included BibTeX file `bibfile.bib` contains several sample entries. BibTeX formatted citations are easily downloadable from search engines. Please use standard journal abbreviations. As much as possible, do include the DOI=`{10.XXXX/XXX}`, entry so that references are automatically hyperlinked (**do not include** the leading `http://dx.doi.org/`).

For a journal article, the recommended fields to be filled in are

```
@article{articlekey,
title={...},
author={Full Surname Sr., First N. and ...},
journal={J. Abbrev.},
volume={33},
pages={555},
year={2016},
doi={10.1000/num.1000}
}
```

Each author is separated by the word **and**. Suffixes are attached to the author last name.

For Proceedings and Conference Articles, several examples are given `bibfile.bib` [5, 6].

### 4 Conclusions

Here is the Summary or Conclusions section.

### Acknowledgments

Here are the acknowledgments. Note the asterisk `\section*{Acknowledgments}` that signifies that this section is unnumbered.

### \*Additional Reminders

- The most common cause of manuscript processing delays is incorrect formatting of the (1) author block and affiliation bylines, and (2) references. Please verify that all blue web hyperlinks resolve correctly.
- The Full Proceedings is also prepared in print. Please follow the maximum page limit of Four (4) pages *including references*.

### References

- [1] A. B. Surname, F. N. Twoword Surname, I. M. Suffix III, and X. V. Fourth, Title of journal article in sentence case with capitalized Proper nouns like Hall effect, *J. Abbrev.* **33**, 555 (2016), Please, do not forget the DOI.
- [2] A. Hyphenated-Lastname and X. J. Lastname Jr., Title of eprint or arXiv paper, [arXiv:1601.00000](#) (2016).
- [3] B. V. Lastname and F. Last, *Title of Book* (Publisher Name Inc., City Address, 2007).
- [4] F. N. Lastname, Article title with no URL or DOI, in *Proceedings of the 4<sup>th</sup> Conference of Organization* (Conference Venue, Country, 2017), P23123.
- [5] F. N. Lastname, Proceedings entry with a URL and Article Identifier number or Page number, in *Proceedings of the 10<sup>th</sup> Conference of Organization* (Conference Venue, Country, 2018), [SPP-2018-XXX](#).
- [6] F. N. Lastname and F. N. Lastname2, Proceedings entry with a DOI, in *Society Conference on Physics Topic SCPT2018* (City of Conference, Country, 2015), [626-630](#).