Journal of the International Society for Teacher Education

Volume 23 Issue 1

Teacher Education in Post Nation State Era

Journal of the International Society for Teacher Education

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ISSN 2521-6015 (online)
ISSN 1029-5968 (print)

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We are indebted to the following individuals who gave their time and expertise to review the manuscripts for this issue. We could not do this job without their reviews.

Ingebjørg Aarek, Agder University, Norway; Ugochukwu K. Agi, Ignatius Ajuru University of Education, Nigeria; Anne Ask, Agder University, Norway; Cornelia Brodahl, University of Agder, Norway; David Byrd, Weber State University, USA; Jackie Chan, Hong Kong Baptist University, Hong Kong; Shirley Dawson, Weber State University, Utah; Vera Lucia Fellicetti, Centro Universitário La Salle, Brazil; Patrick Leytham, Touro University Nevada, USA; Louise Moulding, Weber State University, USA; Modupe Osokoya, University of Ibadan, Nigeria; Karen Bjerg Petersen, Aarhus University, Denmark; Clay Rasmussen, Weber State University, USA; Sheryl Rushton, Weber State University, USA; Kinley Seden, Masaryk University, Czech Republic; Kemma Tsujino, Osaka City University, Japan; Hanne Balsby Thingholm, Aarhus University, Denmark; Unni Wathne, University of Agder, Norway; Nuray Senemoğlu, Haceteppe University, Turkey; *English edit and final reviews:* Peggy Saunders, Weber State University, USA

JISTE is an official, refereed publication of ISfTE. The goal of ISfTE is to publish five to eight articles in each issue. Using the seminar theme, articles in the first issue of each volume are based on papers presented at the previous seminar. Articles in the second issue are non-thematic or have special themes. Points of view and opinions are those of the individual authors and are not necessarily those of ISfTE. Published manuscripts are the property of JISTE. Permission to reproduce must be requested from the editor.

JISTE is issued twice yearly by the International Society for Teacher Education. The subscription price of $75.00US is included in the annual membership fee. Institutional subscription to JISTE is $95.00US per year.

JOURNAL OF THE INTERNATIONAL SOCIETY FOR TEACHER EDUCATION

Volume 23, Number 1

From the editors – About this issue – JISTE 23.1.

By Karen Bjerg Petersen and Peggy J. Saunders, Editors of JISTE

We are pleased to present the current issue of the *Journal of the International Society for Teacher Education*, JISTE, Volume 23, number 1 featuring the theme: *Teacher Education in Post Nation Era.* The articles in this edition were originally presented in paper groups at the annual seminar of the International Society for Teacher Education, which was held in Joetsu/Myoku, Japan at the Joetsu University of Education in May 2018. The fruitful discussions and activities in the paper groups are reflected in the articles presented in this issue of JISTE. The authors in the issue address a variety of topics.

In all parts of the world, an effort of teacher educators is to provide ongoing professional development for in-service teachers. Two articles from Norway address that issue. The first article entitled "Engaging Mathematical Reasoning-and-Proving: A Task, a Method, and a Taxonomy" by Wathne and Brodahl focuses on the professional development of teachers of mathematics.

The second article by Ask, Valand, and Aarek addresses a specific case within Norwegian teacher education investigating what happened to action plans developed by in-service teachers for pedagogical entrepreneurship. This article is entitled, "Implementation of Action Plans. Did the Plans end up in a Drawer?" Each of these articles are continuing investigations that these researchers are conducting related to professional development of in-service teachers.

The authors Ayanwale, Adeleke, and Mamadelo from Nigeria address important statistical aspects of testing in their article "Item Invariance Person Estimate of Basic Education Certificate Examination: Classical Test Theory and Item Response Theory Scoring Perspective". Their article enlightens the reader to the discrepancies in test scoring.

The last article in this issue is, "Factors Hindering Students from Completion of Studies within the Prescribed Duration - A Case Study of The Public University in Namibia". The authors Hako and Shikongo raise aspects and concerns of university teacher-education students facing various problems that hinder them from graduating in a timely manner from university.

The titles and content of the articles evidence the various aspects of teacher education researchers and teacher educators are facing throughout the world. The articles support the continuous engagement and dedicated educators throughout the world, including our ISfTE members. They demonstrate a deep interest in the development of education, teaching, and learning throughout the world.

We would like to thank the reviewers, who have contributed with several and repeated reviews of the submitted articles for this issue. We are grateful for the active support from scholars all over the world – members and non-members of ISfTE – who have spent their time and used their expertise to review the manuscripts.

ENGAGING MATHEMATICAL REASONING-AND-PROVING: A TASK, A METHOD, AND A TAXONOMY

Unni Wathne and Cornelia Brodahl
University of Agder, Norway

Abstract: *This article is the second paper in a series of papers on studies focusing on teaching mathematical reasoning-and-proving in elementary mathematics classroom. Participants are in-service teachers enrolled in a continuing university education program in mathematics. Results from the first paper suggested the method of imaginary dialogues to have the potential to support in-service teachers in engaging their students in mathematical reasoning-and-proving, and Balacheff's taxonomy of proofs to support in-service teachers in identifying students' argumentation. This study is on the following years' in-service teachers in the program. It examines their perceptions of the usefulness of two constituent parts of this approach, and what insights students' written dialogues might provide. The study draws on G. J. Stylianides' analytic framework for reasoning-and-proving. Main data were obtained from a questionnaire taken by 32 in-service teachers and follow-up interviews with four of them. The study reveals engaging students to reason, argue, and prove, while making students' argumentation visible for teachers was perceived the most useful with imaginary dialogues. The teachers' increasing awareness of levels of argumentation, was perceived to be the most useful with getting exposed to Balacheff's distinctions.*

Keywords: Balacheff's four levels of proofs, mathematical reasoning-and-proving, written imaginary dialogues

Introduction

Students need exposure to reasoning-and-proving activities, and teachers need tasks with which they can engage their students. While teacher educators may recognize proof as a fundamental activity in mathematical practice and the importance of reasoning-and-proving in elementary school, there is a shortage of research and resources they can draw on in preparing pre- or in-service teachers in engaging their students in proving activities in primary and lower secondary classroom (Stylianides, 2016).

This study is a continuation of a series of ongoing studies seeking to contribute to the limited research and need of resources for teacher educators' instructional support. Focus is on a combination of a mathematical task, a method to approach students' mathematical thinking processes, and a taxonomy for analysis. While the previous part of the study (Brodahl & Wathne, 2018) explored perceptions of first experiences with the complex combination as a whole, the current effort is a case study with new teachers under education that narrows the research perspective to the usefulness of the particular method and the particular taxonomy, as perceived by the teachers. It also deals with insights teachers gained in their students' process of reasoning-and-proving, when applying method and taxonomy. The theoretical framework for analysis for the current study, with its research focus on the need of resources for teacher educators' instructional support for teachers' reasoning-and-proving in the classroom, is from Stylianides (2016). Supporting aspects to this framework, Balacheff's (1988) taxonomy of four levels of proofs, constitute the conceptual and theoretical frame provided to the in-service teachers.

Mathematics teacher educators may be well acquainted with the shaking-hand-problem, as it might involve students in shifting from

arithmetic reasoning to algebraic reasoning-and-proving when making a conjecture and justifying it. It deals with finding the number of handshakes needed if a group of people shook hands with each other. In order to give teachers more detailed insight into how students in class develop, the teacher-educator authors started to explore the potential of letting students write dialogues, and in-service teachers use a taxonomy to identify their students' levels of reasoning-and-proving. They assigned in-service teachers to engage their class, in pairs, to continue writing a given dialogue between two imaginary students having started discussing the shaking-hand-problem.

In this paper, we present in-service teachers' experiences with implementing so-called "imaginary dialogues" in their classroom and with their analysis of their students' written reasoning-and-proving. Writing in the form of dialogues was inspired by the method of imaginary dialogues used by Wille (2017), where a single student composes a written dialogue between two protagonists who discuss a mathematical task or question. Wille found the method to initiate reflection processes and argumentation. However, working collaboratively, not individually, makes it a modification of the method. In-service teachers identifying any reasoning-and-proving in their students' dialogue was based on Balacheff's four proof levels (1988).

Research Questions

This paper examined in-service teachers' perceptions on working with the mission of provoking and analyzing their students' reasoning-and-proving. Our research questions were

1. How do in-service teachers perceive the usefulness of introducing imaginary dialogues as a means to engage students in reasoning-and-proving in their classroom?
2. What types of insight in students' processes of reasoning-and-proving do in-service teachers perceive gaining in students' written imaginary dialogues?
3. How do in-service teachers perceive the usefulness of Balacheff's taxonomy in their process of identifying students' levels of reasoning-and-proving in students' written imaginary dialogues?

Theoretical Framework

There are several approaches to what is meant by the terms conjecture, argument, and proof, and the processes of explanation, justification, and proof-related-reasoning, in different research communities within mathematics education (see Reid, 2005, for a review; Stylianides, 2016). Stylianides (2007) offered a definition to proof in the context of a classroom community that includes three criteria:

> *Proof* is a *mathematical argument*, a connected sequence of assertions for and against a mathematical claim, with the following characteristics: (a) it uses statements accepted by the classroom community (*set of accepted statements*) that are true and available without further justifications; (b) it employs forms of reasoning (*modes of argumentation*) that are valid and known to, or within the conceptual reach of, the classroom community; and (c) it is communicated with forms of expression (*modes of argument representation*) that are appropriate and known to, or within the conceptual reach of, the classroom community. (p. 291, emphasis in original)

We adopted this definition for its balance between two considerations, mathematics as a discipline, focusing on what is accepted by mathematicians as proofs, and students as mathematical learners, focusing on what is within the conceptual reach of the classroom community. It underpins the notion of a sufficient argument in class (Brodahl & Wathne, 2018). For this study, we followed Stylianides' (2008) notion of

reasoning-and-proving as describing the overall process of "making sense of and establishing mathematics knowledge" (p. 9) and used the analytic framework for reasoning-and-proving he presented for studying such processes (p. 10).

The mathematics subject curriculum for primary and secondary education (1–13) in Norway (Ministry of Education and Research, 2013), where this study has been conducted, expects students to engage in reasoning-and-proving in all four main activities in accordance with Stylianides' (2008) analytic framework of activities. They started with making mathematical generalizations (identify a pattern then make a conjecture) and end with providing support to mathematical claims (proof-arguments or non-proof arguments). This framework consists of mathematical, psychological, and pedagogical components. The mathematical component distinguishes four constituent main activities, two of them under the notion of mathematical generalization: (a) identifying a pattern and (b) making a conjecture, and two of them under the notion of providing support to mathematical claims: (c) providing a proof and (d) providing a non-proof argument. The framework also offers a further breakdown of these main activities that together comprise reasoning-and-proving to seven subcategories. Five of them are most central for the research focus of this study, as is the support of teachers in engaging their students in making mathematical generalizations and providing a proof: plausible pattern and definite pattern for main activity (a); conjecture for main activity (b); generic example and demonstration for main activity (c).

Balacheff (1988) suggested four levels of proof that differ in the degree of generality required and conceptualization involved, as described in our previous study (see Brodahl & Wathne, 2018, p. 32–33 for more detailed review):

1. Naive empiricism: The learner concludes based on only a small number of cases that are practically convenient to check.
2. Crucial experiment: The learner tests the conjecture with an example well outside the range so far considered, to explore the extent of its validity.
3. Generic examples: The learner concludes on a prototypical case, where an object is chosen not on its own, but as a characteristic representative of its class.
4. Thought experiment: Detached from any examples, the learner arrives at structured logical formulations and formalized symbolic expressions.

Balacheff (1988) identified the first three proof levels as pragmatic, being dependent on actions or visual representations. The third level, though, constitutes a transition from the specific to the general and from pragmatic justification to conceptual. The fourth level Balacheff distinguished as theoretical proof. These four levels constitute a taxonomy of proofs he used to classify proving tasks in school mathematics.

Stylianides (2008) acknowledged Balacheff's terms naive empiricism and crucial experiment as special kinds of empirical arguments for or against a mathematical claim, not qualifying as general evidence. Stylianides' framework separates providing a proof into two categories, generic examples and demonstrations (p. 10). Stylianides suggested a generic example to be a proof that uses a particular case seen as representative of the general case, in accordance to Balacheff (1988), while a demonstration to be a proof that uses formally established modes of mathematical proof, as is similar to Balacheff's thought experiment.

Stylianides' (2016) review of mathematics education research literature justified the importance of reasoning-and-proving as early as elementary school. From both philosophical and pedagogical standpoint, it can be argued that reasoning-and-proving deserves a central place throughout the school mathematics curriculum and is necessary for deep learning in mathematics. Nevertheless, in the body of research literature, numerous factors are found to have contributed to a rather marginal place of reasoning-and-proving in the elementary mathematics classroom. Stylianides (2016) singled out four factors for attention:

1. *Teachers' knowledge*: the weak knowledge that many elementary teachers have about proof
2. *Teacher's belief*: their presumed beliefs that proving is an advanced mathematical topic beyond the reach of elementary students
3. *Pedagogical demands*: the high pedagogical demands placed on elementary teachers who strive to engage their students in proving
4. *Instructional support*: the inadequate instructional support offered or available to elementary teachers about how to achieve that goal in their classrooms. (pp. 21-24)

The interdependence and multiplicity of factors hampering imply no easy solution to elevating the place of reasoning-and-proving in elementary mathematics classroom. In this study, these factors will serve as a frame for analysis of in-service teachers' applying the given task, method, and taxonomy.

Method

Case study method was used for this study. The study involved both qualitative and quantitative research methods with data from in-service teachers' project reports, questionnaires, and from interviews conducted by the researchers. This section describes the participants, setting, instruments, and procedures for analysis used for the case study.

Participants

As in the first study (Brodahl & Wathne, 2018), subjects are in-service teachers in upper primary and lower secondary school enrolled in Year 1 of a national program of continuing university mathematics education, called "Competence for Quality", delivered entirely online. The program focuses on teachers with general teaching certificates who already work as teachers and teach mathematics. It provides scholarships for further training to increase the teachers' formal competence in mathematics and mathematics education to meet new qualification requirements for teaching mathematics. Different from the first study with data from autumn 2016, this study drew on data from the following year's program in autumn 2017.

All 52 in-service teachers who attended the course constituted the new purposive sample. Of those fifty-two, 32 teachers gave their consent to participate in the research (61.5 % of the sample with 15 male and 17 female) from across the country ranging in age from 28 to 56 (mean 44.5, median 45). The classes they taught ranged from grade four to 11 with 10 participants teaching upper primary, 21 participants teaching lower secondary, and one teaching upper secondary level.

Setting for the Study

Like the setting in the first study (Brodahl & Wathne, 2018), in-service teachers were assigned to plan and accomplish a teaching session where they should apply the method of imaginary dialogues in their classroom, presenting the same "shaking hands" dialogue between Knut and Idunn (p. 34) and letting students continue working on the mathematical problem in pairs or groups of three.

In preparation, in-service teachers were introduced to Balacheff's levels by a video providing characteristics for each level as well as exemplifying how students may argue for the sum of two odd numbers to be

even on the respective level. In-service teachers were also introduced to the idea of imaginary dialogues as a method to get students started and working with reasoning-and-proving in the classroom. They were offered six examples of dialogues, called "start dialogues", among them the one on the handshake problem to be used in the task. After the teaching session, in-service teachers reported on their experience.

Data Collection

In-service teachers' reports after their session in class was a task in two parts. The first part was to briefly describe the planning and implementation of the session, what was expected and what was experienced. The second was to pick up and present two of their students' dialogues and identify any reasoning-and-proving based on Balacheff's hierarchy of proof levels in school mathematics. The project reports were a required pass/fail assignment for the course to be submitted in the learning management system, Canvas, by the deadline.

The questionnaire opened with three close-ended elements targeting participants' experience with reasoning-and-proving before project start. Data were mainly drawn on 17 elements from the following two parts, both close and open-ended. Part 1 covered in-service teachers' experiences from their lesson with imaginary dialogue and reflected research questions 1 and 2. Along four topics, part 1 asked to describe experiences with the implementation of imaginary dialogues in classroom:

1. Specific aspects of the session with imaginary dialogues that went well.
2. Specific aspects of the session with imaginary dialogues that could be improved.
3. Perceived usefulness of the session with imaginary dialogues.
4. Insights into students' mathematical reasoning-and-proving gained in the session.

One statement concerned with the perceived usefulness of imaginary dialogues was to be rated on a 1-10 scale. Eight statements were posed, and respondents asked to indicate on a five-point Likert scale what best represented their experiences with imaginary dialogues in teaching.

Part 2 covered in-service teachers' experiences from their analysis of students' written dialogues and reflected research question 3. Along two topics, it asked to describe experiences with identifying students' reasoning-and-proving based on Balacheff's theory of proof levels:

1. Specific aspects according to Balacheff's level classification that were helpful.
2. Specific aspects according to Balacheff's level classification that were challenging.

It contained one five-point Likert scale statement and one 1-10-point scale statement to indicate their experience with and perceived usefulness of Balacheff's levels of proof.

Different from the previous study, semi-structured interviews were chosen as the primary source of data for this study because usefulness and insights identified in the questionnaires were not directly observable. The participants received the interview guide, structured in four parts, prior to the interviews. Part A targeted in-service teachers' background and experience with reasoning-and-proving before project start. For parts B and C, the point of departure was in-service teachers' questionnaire response to the respective 1-10-point scale statement, respectively in parts 1 and 2, followed by additional questions taking the form of statements (e.g., "In the questionnaire, you answered…" or "... you described…"), seeking in-service teachers' explanations and clarifications. Part D targeted their project report and asked to comment their

findings (e.g. "You responded… Could you elaborate?").

The study was announced in Canvas where in-service teachers could give their informed consent to complete an online questionnaire (using SurveyXact.com) and allow their project report to be used in the research, in addition to a possible follow-up phone interview. "Reflecting the variety of experiences represented in questionnaires" was announced as the main criterion for selecting interviewees from the pool of volunteer candidates.

Thirty-two agreed to provide their reports and reply to questionnaire; ten of them agreed to be interviewed. Seven participants completed the interviews: four males and three females of varying ages (32.5-56.4 years, average 46.3). Interviews were conducted by phone after the exam and transcribed. Four of them are presented in the study: two males and two females, 32.5-56.4 years, average 47.6, who resided in different parts of the country. The criterion of data saturation was used to determine whose data were used. The three remaining did not yield considerably new information. The written material was anonymized before analysis.

Data Analysis

In-service teachers' reflections in the concluding part of their reports were analyzed by both researchers, and dominant themes and codes were identified and subsequently applied to all reports. They were discussed and structured, then used to refine the research questions and to build the questionnaire.

Fixed-choice responses in questionnaires were organized in Microsoft Excel and the open-ended descriptions in Word. All data were encrypted and shared between the researchers. Coding was mainly guided by the research questions and questionnaires' themes. Both researchers analyzed and coded the descriptions independently, then together organized themes and codes in a multifaceted codebook in an iterative process using inductive and deductive approaches (Bryman, 2012). Independently coding and recoding the data set, they compared and discussed coding until consensus was established. In a corresponding procedure as used for questionnaire responses, researchers' interview transcriptions were coded with the codebook as a sound basis to build on and analyzed using a content analysis approach (Bryman, 2012).

Results

Thirty-two in-service teachers in the class (61.5 %), hereafter called participants, agreed to provide their reports and reply to a questionnaire. Interviews with four of them established data for analysis (7.7 %). In the questionnaires, 44 % of the participants declared to have received an introduction into proof and argumentation prior to the project. Two-fifths stated not having experience with designing mathematical claims and arguments for and against; 38% asserted to have included very little argumentation and proof in their teaching.

Questionnaires and Reports

According to participants' ranking (Table 1), 71.9 % of the in-service teachers perceived imaginary dialogues useful (7-10) as a tool for engaging students in reasoning-and-proving in the mathematics classroom, 12.5 % not useful (1-4), while 15.7 % responded neutrally (5-6) about their usefulness. As for the perceived usefulness of Balacheff's levels of proof, 68.8 % thought they were useful, 12.5% not useful, and 18.7% rated the question neutrally.

Table 1
Rankings of Perceived Usefulness

Statement	10	9	8	7	6	5	4	3	2	1
Imaginary dialogues	**4** *(12.5)*	**4** *(12.5)*	**6** *(18.8)*	**9** *(28.1)*	**2** *(6.3)*	**3** *(9.4)*	**3** *(9.4)*	**1** *(3.1)*	**0** *(0.0)*	**0** *(0.0)*
Balacheff's levels of proofs	**4** *(12.5)*	**3** *(9.4)*	**7** *(21.9)*	**8** *(25.0)*	**5** *(15.6)*	**1** *(3.1)*	**1** *(3.1)*	**2** *(6.3)*	**1** *(3.1)*	**0** *(0.0)*

Note: *n*=32. Response frequencies in bold, percentage italicized. Participants were asked to rate on a scale of 1 to 10 with 10 being very useful and 1 not useful.

The count of responses (see Table 2) to statements 1-5 concerned the use of imaginary dialogues in reasoning-and-proving tasks. Nearly half of the participants (46.9 %) agreed to have experienced the lectures challenging to prepare or implement. While half (50.1 %) perceived that students did not immediately understand the task or start writing the imaginary dialogue, 53.1 % perceived that students enthusiastically continue writing, and 71.9 % found students explaining their thoughts and putting their ideas into words – building mathematical arguments. As to statement 6, 81.3 % found Balacheff's levels of proof useful in identifying students' reasoning-and-proving. Statements 7-9 on future directions (7-9) revealed that most (81.3 %) anticipated imaginary dialogues useful in teaching when the teacher and the class have more experience. Likewise, 81.3 % expressed that they want to continue using imaginary dialogues. Finally, 87.5 % indicated the task revealed the importance of providing their students with exploring and explaining opportunities.

Table 2
Participant Experiences

	Responses					
Statements	SA	SLA	N	SLD	SD	TA
My lecture on imaginary dialogue was challenging to prepare or carry out.	**5** *(15.6)*	**10** *(31.3)*	**6** *(18.8)*	**9** *(28.1)*	**2** *(6.3)*	**15** *(46.9)*
The students understood the task and continued writing the imaginary dialogue.	**3** *(9.4)*	**8** *(25.0)*	**5** *(15.6)*	**14** *(43.8)*	**2** *(6.3)*	**11** *(34.4)*
The students were enthusiastic when they continued to write an imaginary dialogue.	**7** *(21.9)*	**10** *(31.3)*	**3** *(9.4)*	**10** *(31.3)*	**2** *(6.3)*	**17** *(53.1)*
The students explained their thoughts and put their ideas into words when they continued to write an imaginary dialogue.	**10** *(31.3)*	**13** *(40.6)*	**4** *(12.5)*	**2** *(6.3)*	**3** *(9.4)*	**23** *(71.9)*
My students built an argument when they continued writing an imaginary dialogue.	**6** *(19.8)*	**17** *(53.1)*	**4** *(12.5)*	**4** *(12.5)*	**1** *(3.1)*	**23** *(71.9)*
Balacheff´s levels of proof were useful in identifying my students' reasoning-and-proving.	**10** *(31.3)*	**16** *(50.0)*	**3** *(9.4)*	**2** *(6.3)*	**1** *(3.1)*	**26** *(81.3)*
Imaginary dialogues will be useful in teaching when I and the class get more experience.	**14** *(43.8)*	**12** *(37.5)*	**5** *(15.6)*	**1** *(3.1)*	**0** *(0.0)*	**26** *(81.3)*
I will continue to use imaginary dialogues in my teaching.	**12** *(37.5)*	**14** *(43.8)*	**4** *(12.5)*	**2** *(6.3)*	**0** *(0.0)*	**26** *(81.3)*
Working with imaginary dialogues has shown how important it is that the students are allowed to explore and explain.	**11** *(34.4)*	**17** *(53.1)*	**3** *(9.4)*	**1** *(3.1)*	**0** *(0.0)*	**28** *(87.5)*

N=32 *Note*. Response frequencies in bold; percentages italicized. Key for Table 2: strongly agree (SA); slightly agree (SLA); neither agree or disagree (N); slightly disagree (SLD); strongly disagree (SD); and total agreement (TA) adds SA and SLA together.

The most frequent experiences and perceptions quoted in open-ended statements from the questionnaire are grouped based on the codebook. The groups are listed in descending order of frequency:

- What-went-well with imaginary dialogues or was perceived useful?
    - Students became committed in a new way.
    - Students explored and expressed mathematics ideas.
    - Teachers increased their awareness of students' capability of argumentation and need of starting early to train.
    - Students engaged in mathematical discussion.
    - Students, usually not active in mathematics lessons, participated.
- Insights into students' mathematical reasoning-and-proving.
    - how they approached and coped, e.g. point of departure, angle of entry, path of thinking, conjectures and testing
    - how they used their knowledge and where they came to a halt
    - the large variation of reasoning-and-proving in class
- Perceived usefulness with Balacheff's level classification
    - helped identifying and distinguishing students' levels of reasoning-and-proving
    - provided a system of concepts and notions
    - arose teachers' awareness of own teaching and students' need to train reasoning skills
- Perceived challenges with Balacheff's level classification
    - to separate the levels and determine students' proficiency
    - to place the students' dialogue on right level
    - to transfer theory to practice

Other most frequently mentioned issues: Almost half of the participants brought up examples of students struggling with writing down the continuing dialogue. Almost one third perceived the method of imaginary dialogues less suitable for some of their groups, including low-achieving students, students with foreign background or behavioral difficulties, or immature students being most keen to fool about. One third emphasized, optimistically or apologetically, that this was both for them and students a new method to get familiar with so that they could succeed better. The most prevailing improvement suggestion was to spend more time on both introducing the method of imaginary dialogues, and next time applying it to students' writing imaginary dialogues or presenting their findings.

The reflections in the participants' reports deal with the same issues as their responses to the open-ended questionnaire statements do and substantiate these.

Interviews

In-service teacher A, sixth grade: She explained her reasons for ranking usefulness of imaginary dialogues, 10 of 10 points, by "it was amazing to get to know the students' way of thinking", "to get better acquainted with the students' ability to argue", and "in fact, to realize that [the students] need to formulate early and explain why." Teacher A was surprised by "the diversity in my class" and explained, "I got more insight into how [the students] think when I use [this] method. Having sufficient time to argue, students choose to look for possible approaches to solve the problem, and not just the right answer". She explained her reasons for ranking usefulness of Balacheffs' levels of proof, 9 of 10 points, "I might then be able to see when my students actually take the step away from a practical approach, but at the same time when they are at such a low level, [...] they may just get up and 'have a sniff' [towards next level]". She gained insight into her students' levels, as being pragmatic, confirmed that her students

"have not moved on to a conceptual proof", and pointed out the importance of "the teacher being able to explain at that level as well".

In-service teacher B, eighth grade: She explained her reasons for ranking usefulness of imaginary dialogues, 8 of 10 points, by "[the students] in a way go into a role where they are other people", and "[the students] both thought, and they wrote". Teacher B assessed insight in students' reasoning-and-proving and their explanations on "why" and "how" they are using the different approaches. She explained giving 8 of 10 points for the usefulness of Balacheff's levels by the system being a "step by step" hierarchy and great "to put [students' arguments] in the system". Teacher B sought to facilitate for students "to become aware of where they are" and "try to step further".

In-service teacher C, ninth grade: He ranked usefulness of imaginary dialogues 7 of 10 points and strongly emphasized that when students "have to explain in their own words how and why they do it, they will learn in a better and deeper way". It was his clear experience that "the students only were concerned with determining the solving, not with the way to the solution", just like "they tend to be in the classroom". Teacher C observed that his students "talked much better together than they wrote down". Ranking the usefulness of Balacheff's levels with 8 out of 10 points, he explained that "using the Balacheff levels means that you get some shelves to sort on", however, students could slightly change level along their path and move on from one level towards the next. Also, a group may for a short while reach a higher level, but then fall down to the lower. "Covering the levels a student may take, [Balacheff] provides a systematics that is easy to deal with". The written dialogues, he assumed, "may also support formative evaluation", and continued, "Students reaching a higher level, show that they manage to develop their reasoning-and-proving."

In-service teacher D, tenth grade: He explained his high ranking, 10 of 10 points, for usefulness of imaginary dialogues, saying: "I clearly see the advantage of mathematical [formulations] entering into their language", and "Language and thoughts connect [in their] mathematical argumentation". Teacher D experienced "committed students", and his "insight gained was that students' argument develops within the taxonomy of Balacheff'. Explaining his highest ranking for the usefulness of Balacheff's levels, he expressed "how fun it was to discover the preciseness of Balacheff's model and how easy to place students' argument into it".

Discussion

A high percentage of in-service teachers reported to have been a little familiar to reasoning-and-proving before the project. This response is consistent with teachers' preconditions in the literature. According to Stylianides (2016), the weak knowledge about proof appears as *factor 1* of four challenges involved for non-specialist teachers of mathematics (see "Theoretical Framework" section). This weakness makes proof hard to teach and contributes to a rather marginal place of reasoning-and-proving in the elementary classroom.

Teacher educators offered in-service teachers the method of imaginary dialogues to promote their students' mathematical reasoning-and-proving, as well as Balacheff's taxonomy to identify students' argumentation. This combination should aim to remedy some of the hardships of teaching and learning proof, *factor 4*, inadequate instructional support (Stylianides, 2016) and hopefully enable elevating reasoning-and-proving in classroom. Still, teachers may rise both unique and similar first experiences, as their prior mathematical knowledge, their

learning and teaching experiences, and context, differ.

Research Question 1

In answering the first research question – how they perceived the usefulness of imaginary dialogues as means to engage students in reasoning-and-proving – in-service teachers rated their experience as positive. This positivity also appears in the interviewees' open answers and interview. However, their reasons differ slightly. Teacher A, C, and D concurred that students' formulating, explaining, and reflecting are the greatest benefits. These teachers alluded to the following: The written dialogues helped the teacher realize students' need to learn to formulate and explain early on in their education; writing the dialogues supported language and connecting thoughts; by having students explain in their own words how and why they do it in a certain way, they learn better and deeper.

Teacher B saw the usefulness of students taking a different role: Writing the dialogues let students enter into a role where they, more fearless, act as other people. According to the questionnaires, some students took on the given roles in the start dialogue, while some others preferred arguing "as themselves". Understandably, one teacher asserted, "Knut and Idunn in the start dialogue appeared a bit too enthusiastic to relate to." It is valid to speculate that students' age may play a role. The older the students, the less likely they were to take the characters' roles.

Perceived usefulness may undergird imaginary dialogues to have the potential to support in-service teachers in engaging their students in mathematical reasoning (Wille, 2017). Teacher A's experience of the usefulness of the method in her six-grade class and perception of the possibility and necessity of beginning early is in line with Stylianides (2016) who stressed the importance of developing mathematical argumentation early in the elementary school.

Research Question 2

Analyzing all questionnaires to answer the second research question – what types of insight in students' process of reasoning-and-proving they perceived gaining in students' written dialogues – revealed that many teachers could detect both well-running approaches and where students came to a halt. This response was clearly valid for three of the interviewees. Teacher B left this answer blank. However, all four exemplified and highlighted the importance of support given to gain insight in students' way of thinking and different approaches. These insights then could create meaningful learning opportunities for their students to engage in reasoning-and-proving. The findings suggested imaginary dialogues can be cited as instructional support, a method available to elementary teachers to engage their students in powerful mathematical activity including reasoning-and-proving. Instructional support is rarely available, or it is inadequate (Stylianides, 2016); *factor 4* is a synergy of many factors relating to the marginal place of reasoning-and-proving. Teacher educators may welcome this contribution.

Teacher C expressed concern that only a small number of students focused on the approach to the handshake problem. Instead, they were more concerned with the solution, finding a number, a pattern, or a formula. The students resorted back to the way they used to do things in the whole-class teaching situation. Even the teachers who had experience with teaching reasoning-and-proving still encountered challenges getting students to shift their paradigm due to established pedagogical practices. Other researchers found similar high pedagogical demands, constituting *factor 3*, related to the marginal place of reasoning-and-proving (Stylianides, 2016).

Research Question 3

In answering the third research question – how in-service teachers perceived the usefulness of Balacheff's taxonomy to identify levels of reasoning-and-proving in students' written dialogues – they rated their experience as positive. Reasons for their positivity include its suitability and applicability to identify students' levels of reasoning-and-proving, provide a system of concepts and notions, and contribute to awareness of their own teaching. The interviewees all found Balacheff's taxonomy useful and, for the most part, easy to deal with. It assisted the teachers in recognizing their students' ability to make arguments and their progression in reasoning-and-proving.

While stating the usefulness of the taxonomy, in-service teachers experienced challenges with Balacheff's classification system. However, in-service teachers' perceived challenges may partly be due to the weak knowledge about reasoning-and-proving that many teachers reported in this study (cf. *factor 1*). Teacher C called for more levels to sort on, stating in the questionnaire, "Placing the students at the right level can be challenging, and there will be sliding transitions." As to preciseness and number of levels, there are later extensions on the base of Balacheff's taxonomy. Miyazaki (2000) added extensions with six levels of algebraic proof in lower secondary school mathematics, along with contents of proof, representation of proof, and students' thinking. Stylianides (2008) also added to the framework with the psychological and the pedagogical component to the mathematical one with four reasoning-and-proving activities. However, Teacher D found the taxonomy precise enough to place students' argument into. Notably, in the questionnaire, he pointed out the benefit of adopting Balacheff's terminology for gaining an even deeper insight into students' written argument, "I started to use these terms and, by this, came to understand [...] mediated through them. It helped me arguing and reflecting on my reflection in Balacheff's way of thinking." Balacheff's taxonomy contributing to a teacher's deeper insight in their students' reasoning-and-proving may encourage teacher educators who aim to provide required instructional support (cf. *factor 4*).

Conclusion

The problem addressed in this paper concerns teachers currently giving a marginal place to reasoning-and-proving activities. Many in-service teachers in our sample were inexperienced to reasoning-and-proving. They may not have learned about proofs themselves or are not aware of the importance of teaching reasoning. The goal for teacher educators is to develop teachers being prepared to lead to better student experiences of corresponding sense-making activities (Stylianides, 2008). In pursuing this aim, the study focused on assignment design in teacher education.

How did it work to provide teachers with the combination of a mathematical task, a method in classroom, and a taxonomy for analysis of the students' work? Is it worth further developing such instructional support? An important finding from the study is that it is possible to affect and improve teachers' engagement to help their students with learning to reason-and-prove. We interpret the case study results as an indication that planning and accomplishing this teaching session with the method of imaginary dialogues applied to the handshake task was of great help, ignited many teachers, and made them curious about reasoning-and-proving. For teachers, it is a journey not free from obstacles when first time implementing (Brodahl & Wathne, 2018), but most of them expected that both teachers and students will do better next time. The study revealed engaging students to reason, argue and prove, while making students' argumentation visible for teachers was perceived the most useful with imaginary

dialogues. Further, in-service teachers were given a taxonomy for analysis. Their increasing awareness of levels of argumentation was perceived to be the most useful with getting exposed to Balacheff's distinctions. They got a little glimpse and want more. The combination of this mathematical task, this method to approach students' mathematical thinking processes, and this taxonomy for analysis may be part of what teacher educators can provide teachers with to help them generate a reasoning-and-proving activity and identifying students' argumentation. Thus, the study suggests this combination as a possible task design for teacher educators' instructional support.

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INVARIANCE PERSON ESTIMATE OF BASIC EDUCATION CERTIFICATE EXAMINATION: CLASSICAL TEST THEORY AND ITEM RESPONSE THEORY SCORING PERSPECTIVE

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Abstract: *A scoring framework that does not reflect true performance of an examinee would ultimately result in an abnormal score. This study assessed invariance person estimates of 2017 Nigerian National Examinations Council Basic Education Certificate Examination Mathematics Multiple Choice using classical test theory (CTT) and item response theory (IRT) scoring frameworks. The study adopted survey design method. Simple random sampling technique was adopted to select 978 subjects (425 males, 553 females, M=12 years) for the study. One research instrument was used. Data were analyzed using descriptive and paired sample t-tests. There was significance difference (t = 2.635, df = 977, p = 0.01) in the overall mean score of CTT (mean=50.70, SD=10.30) and IRT (mean=47.78, SD=8.49). Also, IRT method of scoring produced different test scores for examinees who had the same raw scores under the CTT method. National Examinations Council should be encouraged to shift their paradigm of scoring from CTT to IRT method.*

Keywords: CTT scoring, IRT scoring, basic education examination, mathematics

Introduction

The *Basic Education Certificate Examination* (BECE) is one of the examinations conducted by Nigerian National Examinations Council (NECO) for examinees who will transit from the three years of junior secondary to the senior secondary category. This examination is what is obtainable globally, and Nigeria is no exception from implementing this aspect of educational system. Candidate are deemed to have passed the BECE if they have credit in six subjects including English and mathematics. Mathematics aspect of BECE conducted by National Examinations Council takes two forms. These forms include (Paper I) – a multiple-choice of 60 items containing items on different themes such as number and numeration, algebraic process, geometry and mensuration, and everyday statistics and (Paper II) – the constructed response test items. In this study, emphasis was on the multiple-choice items because of its ability to cover representative samples of the content of interest without necessarily elongating testing time. It is used to complement constructed response test because of its objectivity in scoring the responses of the examinees.

The trend of fluctuating performance in mathematics among junior secondary school students continues to attract attention of stakeholders in the education sector. Despite the effort of researchers to identify factors responsible for this below average performance and proffer possible solutions, the performance rate has still not improved. This lower performance might hinge on how the assessment practices in terms of test scoring frameworks mar examinees' performance. The wrong assessment framework adopted by the public examining body and teachers might account for one of the reasons examinees' performances in BECE mathematics were fluctuating over years. More so, assessment

is one of the major tools used by global community to collect data for decision making. These assessment data refer to tests administered on a large scale or classroom settings that are designed to evaluate examinees' abilities on various concepts. Usage of assessments can be found in both developed and developing countries, although methods used differ. Assessments are used extensively in the field of education globally. In education, testing is used at many levels for instance, when a school teacher develops a classroom test items and uses learning outcomes to determine relative standing of an examinee in the class. Large scale assessments are administered at the state or national level. These tests and the decisions resulting from them can have significant impact on society at large. The procedure often used by classroom teachers and public examining bodies especially in Nigeria and other African countries, from item development up to scores generated, used traditional methods, which are fraught with many shortcomings such as sample dependent, assume equal error of measurement across the group etc. It is necessary for teachers in schools and public examining bodies to embrace modern testing theory, which is item-based for the development and scoring of examinees. The results from educational assessments are used not only to measure examinees' learning but to assess the effectiveness of teachers and schools.

More importantly, methods used to analyse examinees' responses on an assessment by the school teachers and examining bodies are technical aspects of the testing system. In educational assessment, examinees' ability is a latent trait that is not directly manifest. Instead, observable outcomes such as examinees' responses on an assessment are used to estimate the unobservable latent trait of interest. Item response theory (IRT) is an approach typically used with large scale and teacher-made assessments to model the relationship between examinees' responses and examinees' ability. IRT models can be used with various item types but in the classroom teacher-made test, they are often applied to multiple choice items while public examining bodies use multiple choice and constructed response test.

In educational measurements, two frameworks are used through which valid and reliable scores can be achieved and used for assessing examinees' performance. These are classical test theory [CTT] scoring and item response theory [IRT] scoring. Under the CTT, the examinee's test score would be the sum of the scores received on all the items in the test. This, according to Adegoke (2014), is referred to as number-correct scoring. This method of scoring produces maximum likelihood trait estimates based on raw scores (that is, total number of correctly answered item). In this method, examinees who answer correctly the same number of items irrespective of the items' level of difficulties and discriminations earn the same scale score. Thus, the nature of the items' parameters (difficulty and discrimination indices) are not considered in the scoring of examinees' performance.

IRT is a theory of testing that establishes relationship between an examinee's latent abilities and the probability of the examinee responding to a certain item correctly, estimates the parameters involved, explains the processes, and predicts the result of such an encounter (Hambleton, Swaminathan, & Rogers, 1991). More importantly, the theory is mainly interested in whether an examinee gets an item correct and not in the raw test scores, which is referred to as item-pattern scoring procedure. This scoring method produces maximum likelihood trait-estimate based on pattern of item responses (Adegoke, 2014). To calibrate test items effectively, it is important to put estimation of item parameters into consideration (that is item discrimination, denoted as 'a'; item difficulty, denoted as 'b'; and guessing or

chance factor, denoted as 'c'). Consequently, the value of item parameters and ability depends on the choice of parameter model (Baker, 2001). Item parameter estimate through IRT is invariance of the features of both examinees to which it is exposed and other items that constitute the test. There are three foremost IRT applications for modelling the test data: 1PL, 2PL, and 3PL (parameter logistic) models.

While there is only one parameter ascribed to the trait level of the individual, the task or item is often characterized by the three parameters. The individual trait level is often designated by theta (θ), which represents the amount of ability, trait, or attribute level possessed by an individual. The three parameters associated with the item are (a) discrimination power, (b) the difficulty parameter, and (c) the guessing parameter (Nenty, 2000). In a cognitive task, the a-parameter indicates the degree to which examinees' response to an item varies with or relates to their trait level or ability. The b-parameter is the amount of trait inherent in an item. It represents the cognitive resistance of the item or task. In other words, it is the amount of trait under measurement just necessary to overcome the task or item. The c-parameter is the probability that an examinee possessed low trait in responding to an item correctly (Nenty, 2000).

Perusal of literature showed that in Sub-Saharan African countries, such as Nigeria, limited their testing within the confine of classical test theory application for the development, item analysis, and scoring of individual examinees (Adedoyin, 2010; Adegoke, 2014; Umobong & Jacob, 2016). However, in other areas of the world, such as the United Kingdom (UK), Ireland, United States of America (USA), and Germany, IRT application for large scale testing and scoring procedure has witnessed tremendous acceptance in measurement and research practice (Courville, 2004; Fan, 1998; Fitzpatrick & Yen, 1995; Stage, 2003; Yen & Candell, 1991). CTT and IRT theoretically connote two different contrasting frameworks; therefore, it is expected that using just any of the two frameworks without assessing assumptions and appropriate scoring framework will surely affect the final scores of the examinees. For instance, if CTT method of scoring is used, which looked at the ability of examinee based on the total score rather than looking at examine ability based on each of item, it could lead to disparity and inaccuracy in the scores of examinees coming from CTT rather than IRT frameworks. Several empirical studies concluded that there existed a statistically significant difference in the test scores of the examinees using the two contrasting frameworks (Fitzpatrick & Yen, 1995; Wilberg, 2004; Yen & Candell, 1991). However, the position of Adegoke (2014) and Courville (2004) disagreed with the earlier submission. They found out that there was no statistically significant difference in the examinees' overall mean test scores under CTT and IRT scoring frameworks. In these studies, examinees' ability was established using different test data such as ACT assessment test, public examining external tests, and teacher-made tests. Despite their propositions on comparability of examinees' ability estimate under CTT and IRT frameworks, none of their studies considered investigating ability estimate of *Basic Education Certificate Examination* of junior secondary school 3. Hence, it is imperative to carry out a study in this area.

Research Questions

Three research questions were advanced for this study.

1. Do test data of 2017 BECE mathematics fulfils dimensionality and item local independence assumptions of IRT method?
2. What are the estimated examinees' mean test scores of 2017 NECO BECE

mathematics using the two contrasting frameworks (CTT and IRT)?
3. Is there any significant difference in the test scores of the examinees using the two contrasting frameworks (CTT and IRT)?

Methods

This study adopted survey research design. The population for the study comprised of private junior secondary three (JSS3) students who enrolled for *Basic Education Certificate Examination* (BECE) in Osun State, Nigeria. An intact class of junior secondary school 3 was drawn randomly from Osogbo and Olorunda local government areas (LGAs) making 978 examinees altogether. Among the 978 sampled participants, 425 (43.5%) were boys, 553 (56.5%) were girls, and their mean age was 12 years. The instrument used was the 2017 NECO *Basic Education Certificate Examination Mathematics Multiple Choice Test*. The test consisted of 60 items each having five response options which were dichotomously scored as right or wrong. Data were analysed three ways: (a) expected a posteriori (EAP) for the establishment of person scoring used jMetrik™ software (Psychomeasurement Systems, 2018); (b) non-linear factor analysis used normal ogive harmonic analysis robust method (NOHARM) software version 4.0 (McDonald, 1997, 1999); and (c) conditional independence was assessed using Yen Q3 statistics implemented in jMetrik™ software.

Results

Dimensionality and Item Local Independence Assumptions of IRT Method

Assessment of unidimensionality assumption of 2017 National Examinations Council BECE mathematics items was done using non-linear factor analysis implemented in normal ogive harmonic analysis robust method (NOHARM statistical software). NOHARM is a computer program for fitting both unidimensional and multidimensional normal ogive models of latent trait based on theory developed by McDonald (1997, 1999). Similarly, its ability to determine the actual number of factors embedded in the test data through model-data fit indices cannot be overemphasized. More importantly, from the result of the analysis, there is what we called residual matrix (lower off-diagonal), which is the point where NOHARM model-data fit information are found. It produces this residual matrix to aid model-data fit analysis. The residual matrix establishes the difference between the observed covariances and that of the items after the model has been fitted to the data. Thus, the best condition is where the differences are zero (0).

In Table 1 below, it can be observed that unidimensional solution's residuals are relatively small compared to the item covariances. More so, scrutiny of the residual matrix does not disclose any large residuals. Therefore, to review the residual matrix, NOHARM provided its root mean square (RMS). The RMS is the square root of the average squared difference between the observed and predicted covariances. Thus, root mean square with small values indicates good fit. McDonald (1997) suggested that the overall measure of model-data fit may be evaluated by comparing it to four times the reciprocal of the square root of the sample size, which can be expressed mathematically as RMS criterion $= 4 \frac{1}{\sqrt{sample\ size}}$

In this study, the sample size was 978, and this size gave RMS criterion of 0.128. Thus, if the estimated value from root mean square (RMS) residual (0.022) was significantly small compared to that of RMS criterion (0.128), the conclusion is that the test data are measuring only a single construct. Another measure of dimension is Tanaka's (1993) goodness-of-fit index

(GFI). McDonald (1999) suggested that a GFI of 0.90 indicates an acceptable level of fit, a value of 0.95 indicates good fit, and GFI of 1.00 indicates perfect fit. Therefore, the estimated GFI (0.9009) indicates an acceptable level of fit. It can be observed, based on the aforementioned indices, that one-dimension model fits the data substantially. Similarly, reliability test analysis was used to corroborate the result from the model-data fit using NOHARM for establishing unidimensionality. Guttman's L2 gave reliability coefficient of 0.799, and the standard error of measurement (SEM) was 3.2134 with 95% confidence interval. These results indicated that the 2017 BECE mathematics was unidimensional.

Table 1

Residual Matrix (Lower Off-Diagonals)

Items	47	48	49	50	51	52	53	54	55
47	0.042								
48	-0.001	0.001							
49	-0.008	0.004	0.011						
50	7.2e-6	-0.001	-0.009	-0.004					
51	-0.037	-0.043	-0.002	-0.009	-0.029				
52	0.047	0.037	-0.008	0.011	0.035	0.028			
53	-0.001	-0.008	-0.002	0.007	0.002	-0.007	-0.037		
54	0.039	0.035	0.003	0.011	0.034	0.027	-0.015	-0.042	
55	0.020	0.015	-0.001	2.3e-4	0.022	0.005	-0.014	-0.061	-0.019
+									
59	-0.004	-0.002	-0.007	-0.031					
60	-0.008	0.003	-0.039	0.037	0.032				

Notes: Sum of squares of residuals (lower off-diagonals) = 0.8199; Root mean square of residuals (lower off-diagonals) = 0.0215; Tanaka index of goodness-of-fit = 0.9009

Yen Q_3 statistics was used to establish item local independence of test data implemented on jMetrik™ software. Yen Q_3 statistics is the correlation of residuals for a pair of items after the person location estimates are controlled for. After obtaining the residuals, the linear correlation between the residuals from pair of items (say item 1 and 2, item 1 and 3, item 1 and 4 and so on until all the items in the test are all paired) is then examined to find pairs of items with large residual correlations. In this study, 1770 linear correlations were established using jMetrik™ software. Correlation coefficient larger than 0.2 screening criterion suggested by Yen (1993) indicated that the paired item violates local item independence. Therefore, it can be observed in Table 2 below that $Q_3{}^s$ show that about twenty-five (25) item pairs (such as item 2 and 4, item 56 and 59, item 56 and 60 and so on) have absolute value exceeding the screening value of 0.2. This result implies that, after fitting the unidimensional 3PL model to the data, the items in these pairs had slightly more than 10% of their residual variability in common. Thus, these item pairs were considered to be exhibiting item dependence and evidence of conditional dependence in the remaining 1745 pairs was absent. These results gave evidence that the test data meet conditional item independence. Table 2 presents Q_3 statistics (edited) among the 60 items contained in the 2017 NECO BECE mathematics multiple choice exam.

Table 2
Q_3 Statistics for the NECO BECE Mathematics Test Items

Items	1	2	3	4	5	56	57	58	59	60
1	1.0000									
2	-0.0123	1.0000								
3	-0.2013	0.2203	1.0000							
4	-0.1560	0.3863	0.1792	1.0000						
5	-0.0817	-0.0866	0.1754	-0.1731	1.0000					
+										
56	-0.0235	0.0524	0.0148	0.0120	0.0644	1.0000				
57	0.0404	0.0633	0.0874	-0.1321	0.0187	-0.2492	1.0000			
58	0.0408	0.0512	0.1041	0.0061	0.0015	0.2111	0.1936	1.0000		
59	-0.1130	0.0128	-0.0548	-0.0115	0.0861	0.4147	0.0040	0.0648	1.0000	
60	-0.0736	0.0136	0.0313	0.0287	0.0764	0.3382	-0.1746	0.0187	0.0465	1.0000

Estimated Mean Scores Using CTT and IRT Frameworks

The examinees' scores in the 2017 NECO BECE 60-mathematics test items were examined, and the raw scores in the CTT model and IRT model were converted to scale score using z-score and t-score respectively. Similarly, the examinees' test score under the CTT framework (number correct scoring) and IRT framework (item pattern scoring) were both converted to the same metric using t-score (t = 10z + 50). The examinees' test score under CTT framework was first transformed to z-score, using the equation $z = \frac{X - \mu}{\sigma}$, where x = examinee's test score, μ = mean of the test scores obtained by all examinees, and σ = standard deviation of the test scores obtained by all examinees. After that, the scores were transformed to t-score. The examinees' ability estimate (in z-score) under IRT was transformed to t-scores. Then the overall mean test scores were obtained. Table 3 presents the mean, standard deviation (SD), and minimum and maximum scores of the examinees' scores in the 2017 NECO BECE 60-mathematics test item under CTT and IRT scoring frameworks.

It can be observed from Table 3 that the examinees' mean score and standard deviation under number-correct scoring method was 50.70 (SD = 10.30) and 47.78 (SD = 8.49) under item-pattern scoring. The mean difference was 2.29. Also, paired-samples *t*-test statistics showed that the mean difference was not statistically significant ($t = 2.635$, df = 977, P = 0.01).

Table 3
Descriptive Statistics of the Examinees' Scores in the 2017 NECO BECE Mathematics

Statistics	Number-correct scoring		Item-pattern scoring	
	Raw score	Z-score	T-score	Z-score	T-score
Minimum	5.00	-2.05	29.51	-0.46	45.40
Maximum	33.00	2.63	76.35	3.78	87.68
Mean	17.25	0.07	50.70	-0.21	47.78
SD	5.98	1.00	10.30	0.85	8.49

Significant Differences Using the Two Frameworks

The scores of six examinees who had a raw score of 31 were examined. Table 4 presents the item parameters (discrimination and difficulty indices) as well as the pattern of responses of the students to the BECE 60 mathematics test items. The table also shows examinees'

corresponding number-correct (NC) and item-pattern (IP) scores in terms of z-score and t-score.

Table 4
Items Parameters

Item Number	Item Parameter		Six examinees with raw score (NC) of 31					
	b	*a*	*B1*	*B2*	*B3*	*B4*	*B5*	*B6*
1	2.03	0.82	0	0	1	1	1	1
2	1.67	2.86	0	0	0	0	0	0
3	0.70	2.85	1	1	1	1	1	1
+	+	+	+	+	+	+	+	+
58	5.91	1.23	1	1	1	1	1	1
59	1.77	0.82	1	1	0	0	0	0
60	8.50	0.30	1	0	1	1	0	0
NC Score			31	31	31	31	31	31
Z-score (IP)			0.9530	-1.0535	1.2622	2.5366	1.1407	1.8782
Z-score (NC)			2.3003	2.3003	2.3003	2.3003	2.3003	2.3003
T-score (NC)			73.003	73.003	73.003	73.003	73.003	73.003
T-score (IP)			59.530	39.465	62.622	75.366	61.407	68.782

It can be observed in Table 4 that each of the examinees had a raw score of 31 when the number-correct scoring method was used. On conversion to z-score and t-score, all the examined examinees had the same scores, 2.3003 and 73.003 respectively. However, when the item-pattern scoring method was used in estimating the examinees scores, significant variations in the scores emerged. Candidates B1, B2, B3, B4, B5, and B6 had z-score (person score, obtained from jMetrik™ software) of 1.1407, 1.8782, 0.9530, -1.0535, 1.2622, and 2.5366, respectively. When these scores were converted to t-score, candidate B6 had the highest score with 75.366, followed by candidate B2 with score of 68.782, followed by candidate B5 with score of 62.622, followed by candidate B1 with score of 61.407, followed by candidate B3 with score of 59.530, while candidate B4 had the lowest scores of 39.465.

Discussion

The significance of IRT assumptions in educational measurement is inevitable. These assumptions need to be assessed before any further analysis could be carried out on test data. These issues include dimensionality and item local independence. The choice of which IRT model to be used when calibrating test under IRT measurement framework is determined by the number of dimensions embedded in the test data. Thus, the results suggested that test data of NECO BECE 2017 mathematics items satisfy dimensionality and item local independence assumptions of item response theory. Also, it was found that examinees' mean scores' difference between classical test theory and item response theory was statistically significant. This finding is in line with other researchers (Adedoyin, 2010; Fitzpatrick & Yen, 1995; Yen & Candell, 2011) who found statistically significant differences in the examinees'

mean test scores using CTT and IRT scoring approaches. Findings of this study disagree with the findings of Adegoke (2014) and Courville (2004) that no difference observed in the mean scores using CTT and IRT methods. The results also showed that IRT method of scoring produced different test scores for candidates who have the same raw scores under the classical test theory method. The differences observed in the test scores of the candidates under the IRT method of scoring emanates from the disparity in the discrimination and difficulty indices of the 2017 NECO BECE mathematics items. Examinees answered different items of the test correctly. This result is because item statistics are always taken into consideration in the process of estimating examinees' test scores under IRT scoring method. This finding gives credence to the findings of Adedoyin (2010). The researcher found that IRT method of scoring produced different test scores for examinees that had the same raw score under classical test theory method of scoring.

Conclusion and Recommendation

The scoring method adopted by National Examinations Council (NECO) had been the classical test approach despite its ineptitude to estimate correctly the actual ability of the examinees. This method of scoring is neither valid and nor reliable because examinees attempted different sets of items with different psychometric properties (that is difficulty and discrimination indices). Consequently, the study concluded that CTT and IRT examinees' mean score were not comparable, and item response theory method of scoring produced different test scores for examinees that had the same raw score under classical test theory method of scoring. Therefore, it can be recommended that post-primary school teachers, NECO, and other countries that are still operating within the confine of traditional scoring method should shift their paradigm to modern method of scoring, which takes into consideration item parameters indices during estimation of examinees test score.

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IMPLEMENTATION OF ACTION PLANS – DID THE PLANS END UP IN A DRAWER?

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Abstract: *The University of Agder has organized five courses in entrepreneurship (2012-2017) for teachers in primary and secondary school. Emphasis has been on student-active teaching methods, and each participant developed an action plan for entrepreneurship in their schools. The aim of this research was to investigate what happened to the action plans: were the plans implemented or placed in a drawer? What support did the participants receive, and what challenges did they meet? A questionnaire was sent to all course participants (n=126) using SurveyXact, asking about the action plans: Were they implemented, partly implemented, or put aside? Most respondents (87%) implemented or partly implemented the plan. Those who implemented the plan received support from their management and/or colleagues. Attending the course with a colleague increased the implementation rate. Common challenges were time, uncooperative colleagues and students, and lack of support from the management.*

Key words: pedagogical entrepreneurship, action plans, implementation

Introduction

Pedagogical entrepreneurship is a new learning and teaching method still being developed (Riese, 2010). Pedent.no (n.d.), a digital resource to inspire teachers to use entrepreneurship in their teaching, defined *pedagogical entrepreneurship* as an action-oriented education and training in a social context with the student as an agent in their own learning. The European Parliament and the Council of the European Union (2006) has defined the *sense of initiative and entrepreneurship* as one of eight key competencies required for lifelong learning. Norway's *Action Plan for Entrepreneurship in Education and Training* stated

> Entrepreneurship can be a tool and a working method to stimulate learning in different subjects and in basic skills. Entrepreneurship in education and training may also further develop personal characteristics and attitudes. (Norwegian Ministry of Education and Research, Ministry of Local Government and Regional Development, & Ministry of Trade and Industry, 2009, p. 7)

Entrepreneurship has been primarily related to business, management, and the commercial sector (Mahieu, 2006), and it may still be seen in this way by many. However, using entrepreneurship as a method to stimulate learning in school is a different way of using it. Entrepreneurship is defined in the action plan *Entrepreneurship in Education and Training* as:

> [...] a dynamic and social process where individuals, alone or in collaboration, identify opportunities for innovation and act upon these by transforming ideas into practical and targeted activities, whether in social, cultural or economic context. (Norwegian Ministry of Education and Research, Ministry of Trade and Industry, & Ministry of Local Government and Regional Development, 2006, p. 4)

The Norwegian Strategic Plan *See the Opportunities and Make Them Work!* put forward five criteria for the pupils' learning environment that will contribute to increased entrepreneurship activities in schools and towards the fulfillment of the curriculum. The criteria are (a) stimulation

and development of creativity, (b) pupil participation and active learning, (c) interdisciplinary work forms, (d) collaboration between schools and local business life, and (e) productive work (Norwegian Ministry of Education and Research et al., 2006).

The Norwegian Government proposed to rejuvenate the subjects in school to enhance learning outcomes (Norwegian Ministry of Education and Research, 2016). Schools should allow students to develop creativity, dedication, and exploration, and let them gain experience in seeing opportunities and translating ideas into action. The ability to ask questions, explore, and experiment is important for in-depth learning. Pupils will learn and develop through perception and thinking, aesthetic expressions, and practical activities. The Norwegian Ministry of Education and Research (2017) stated that collaboration inspires new thinking and entrepreneurship so that new ideas can be transformed into action. Students who learn through creative activities develop the ability to express themselves in multiple ways, solve problems, and ask new questions.

Unfortunately, few offerings are available in entrepreneurship related to pedagogical subjects and in teacher education. Despite the goal of the *Norwegian Action Plan* (2009) to strengthen the offering in teacher education, a significant decline in such courses has occurred in recent years (Spilling, Johansen, & Støren, 2015). Ruskovaara and Pihkala (2013) claimed that research on teachers' entrepreneurship education is important. However, they also found that the information available on teachers' entrepreneurship education practices is insufficient; there is a lack of tools to support the development of teachers as entrepreneurship educators; and there is not enough information available on the connection between efficient teaching methods and results obtained through entrepreneurship education. To ensure resources for the future development of entrepreneurship education, it is important to establish this connection between teaching methods and results.

Entrepreneurship Courses at Agder

The University of Agder developed two different but equivalent courses in entrepreneurship for teachers in primary and secondary schools in Norway. The courses have been held five times, and the participants in the research have attended one of these. Each course gave 10 ECTS [European Credit Transfer System] credits (European Commission, nd). The main content was how to use entrepreneurship as a teaching and learning strategy according to the *Knowledge Promotion Reform* (Utdanningsdirektoratet [Directorate of Education], 2006). The courses were concentrated over one week and held at a small and quite simple hotel in Lesvos, Greece, with lots of Greek hospitality. (The University of Agder has had their own study center in Lesvos for the past 25 years.) During the courses, the participants had to produce an action plan for entrepreneurship in their school (University of Agder, 2012; 2015). The environment around the course, made it possible for the participants to live, eat, attend lectures, work in groups, and they discussed entrepreneurship even when swimming and walking together (Ask, Røed, & Aarek, 2018). They appreciated the time to work on the action plans, and they looked forward to implementing them at their workplaces. However, some participants were concerned about how the plans were going to be received by their management and colleagues and talked about having to be careful and perhaps "sneak-introduce" them. During or after each course the participants created a closed Facebook group where they could share experiences to help and inspire each other.

Development and Implementation of Action Plans

An action plan is defined as "a detailed set of instructions to follow in order to solve a problem or achieve something" (Action Plan, n.d.). Making plans are important in many parts of life, from business and urban planning to plans for student learning and everyday tasks. Teachers are used to making term plans and lecture plans to help them in their teaching duties. As Ackoff (1970) pointed out

> Planning is something we do in advance of taking action […] a process of deciding what to do and how to do it before action is required. Planning is the design of a desired future and of effective ways of bringing it about. (p. 2)

One of the aims for the course in entrepreneurship was to give the participants an action plan and a tool box full of methods that they can use in their teaching (University of Agder, 2012; 2015). The participants were given guidelines and ample opportunity to develop action plans during the course. The action plans were meant to be a help and a tool for further work with entrepreneurship in their teaching. A resource lecture was given to get them started. To make sure that their goals were clear and reachable, they were introduced to a modified version of Doran's (1981) SMART goals:

- **S**pecific: concrete, easy to understand what to do;
- **M**easurable: possible to measure or notice;
- **A**ccepted: I am willing to do what is needed;
- **R**ealistic: achievable, within reach;
- **T**ime bound: date and itinerary.

Teachers from the same school, level, subjects, or with the same challenges formed groups to help and inspire one another in the work. The content of the action plans varied vastly as the participants were at different stages: some had many years of experience while others were beginners in entrepreneurship. They also focused on different areas, e.g. starting up pupil enterprises, more creative teaching methods, and assessment in entrepreneurial activities. At the end of the week the different action plans were presented to the other participants, and the plans were submitted to the course leader. A message was sent from the organizer to the principals of all the participating schools to inform them about the action plans. They were encouraged to help the teachers to implement the action plans at the schools.

Hopkins (2009) wrote, "Clarity of how plans work leads to more reasonable expectations of what plans can accomplish and more careful choices about when to make plans, about what, for whom and how" (p. xiii). Implementing new plans may also take time, and it is important to have a longer-time view (New Zealand Government, 2012). Change is more likely to happen if more actors are involved, and support from those involved in the change makes implementing more likely to happen (University of Kansas, n.d.). Ask et al. (2018) found that getting time to develop an action plan for entrepreneurship for the teachers' own school was an experience that was valuable and useful. During the school year, limited time is available for creative thinking because every teaching day has enough challenges.

Teachers can find a great deal of information about lesson planning available in books, articles, and on the internet. However, there is not much, if any, information on how to develop an action plan for entrepreneurship in school. Perhaps this is a good thing because it means the teacher will have to think through all the necessary steps and decide who to involve in the implementation. Having to think through the process is an important part of planning (Reeves, 2011). As explained by Montana and Charnov (2008), planning can be a three-step, result-

oriented process: choosing a destination (result), evaluating alternative routes, and deciding the specific course of the plan.

Stufflebeam's and Coryn's (2014) context, input, process, and product evaluations model (CIPP) is a comprehensive framework for conducting formative and summative evaluations of projects. The CIPP evaluation model "is configured to enable and guide comprehensive, systematic examination of social and educational programs that occur in the dynamic, septic conditions of the real world" (Stufflebeam & Coryn, 2014, p. 336). The use of the model should be "not only to prove but to improve" (Stufflebeam & Coryn, 2014, p. 336). In our research we have used process evaluation to investigate whether the time allocated to make action plans during the course is time well spent.

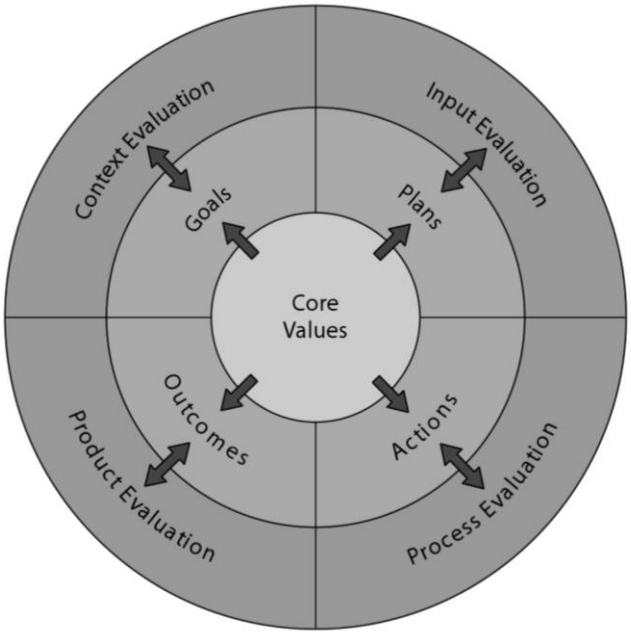

Figure 1. Key components of the CIPP evaluation model and associated relationships with programs (Stufflebeam & Coryn, 2014, p. 318). Copyright 2014 by Wiley. Reprinted with permission.

Elements of the CIPP evaluation model have been used in our research. In the course, the participants worked with the *context* and the *input* of the plan. They decided what was the need at their school or in their classes and developed a plan for what and how to work with entrepreneurship. In this article, we concentrate on the *process* of implementing the action plan. To what degree did the plans get implemented, and what obstacles did the teachers meet when implementing the plans? According to Hrebiniak (2008) there are obstacles to effective implementation of any plan. Planning and execution are dependent on each other. The plan is more likely to be successful if there is an overlap between planner and implementor. Effective implementation takes time and involves people at all levels. For entrepreneurship in school, the plan should be anchored in the school's management. Hrebiniak added that managing change is difficult, and that execution often involves changes in structure, incentives, controls, people, objectives, and responsibilities. Implementing the action plan in entrepreneurship may lead to changes like extended cooperation between teachers and

students, changes in time table and type of exam.

Purpose of the Study

This study was a follow-up of previous studies conducted about the entrepreneurship courses for teachers (Ask et al., 2018). We wanted to know if the action plans created during the course were used by the teachers and their schools. Ultimately, the aim of this research study was to discover how the action plans were received at the different schools. The main research questions were

1. What happened to the action plans when the participants introduced them to their schools?
2. What support did the participants receive, and what challenges did they meet?

Method

The method used in this study is a mixed method design collecting both quantitative and qualitative data to answer the research questions. The research was conducted in the spring 2018. A link to a questionnaire was sent to all participants in five courses (n=126) using the internet tool SurveyXact (Ramboll Management Consulting, n.d.), but only 97 participants received the questionnaire. Some participants had changed their e-mail address since attending the course and were not reached initially. To reach these participants, a message about the survey was posted in the respective Facebook groups, asking them to contact the authors. This resulted in one extra response. A total of 71 participants responded.

The questionnaire contained five multiple choice questions regarding the participants' workplace, whether they attended the course alone or with a colleague, whether the action plan was implemented at their school/workplace, and how positive the management was about supporting them in the implementation of the action plan. Two open-ended questions regarding support and challenges in the implementation were also included in the questionnaire.

Quantitative data were analyzed using SurveyXact and Excel, and qualitative data were interpreted by the authors by categorizing the answers according to topic. The project was shared with the Norwegian Centre for Research Data. No sensitive personal data were collected, and the answers were anonymous.

Results and Discussion

Of the 97 participants who received the questionnaire, 71 participants (73%) answered. Two respondents did not make action plans and were excluded from the analyses. Of the 69 remaining respondents 67% worked in upper secondary school, and 20% worked in lower secondary school. Only 4% worked in primary school, while the rest (9%) worked in higher education, adult education, and *Young Enterprise*. Forty respondents (58%) attended the course with a colleague, while 29 respondents (42%) were the only one from their workplace.

In the survey, the participants were asked what happened to the action plans when they introduced them to their schools, were they implemented, partly implemented, or not implemented? As shown in Figure 2, 60 respondents (87%) implemented or partly implemented the action plan, while 9 respondents (13%) did not.

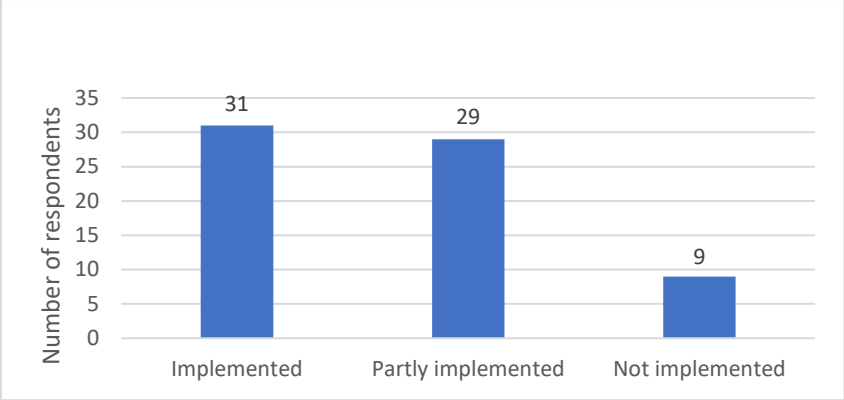

Figure 2. Number of respondents who implemented, partly implemented and did not implement the action plan. n=69

Furthermore, the participants were asked how supportive the management was in implementing the action plan. The possible answers were – very positive, positive, neither/nor, negative, very negative, or management was not involved. The very positive management took part in planning and implementing the plan, the positive gave support but did not take an active part. The neutral (neither/nor) management did not support or discourage the implementation of the plan, while the negative or very negative did not want the plan to be implemented at all.

Figure 3 shows that 38 respondents (55%) said that the management was very positive or positive in supporting them in implementing the action plan. Twenty-seven respondents (39%) reported a neutral management or that the management was not involved, and four respondents (6%) said that the management was negative or very negative. The latter coincides with the findings of Hrebiniak (2008) who found that managing change may be difficult to the people involved.

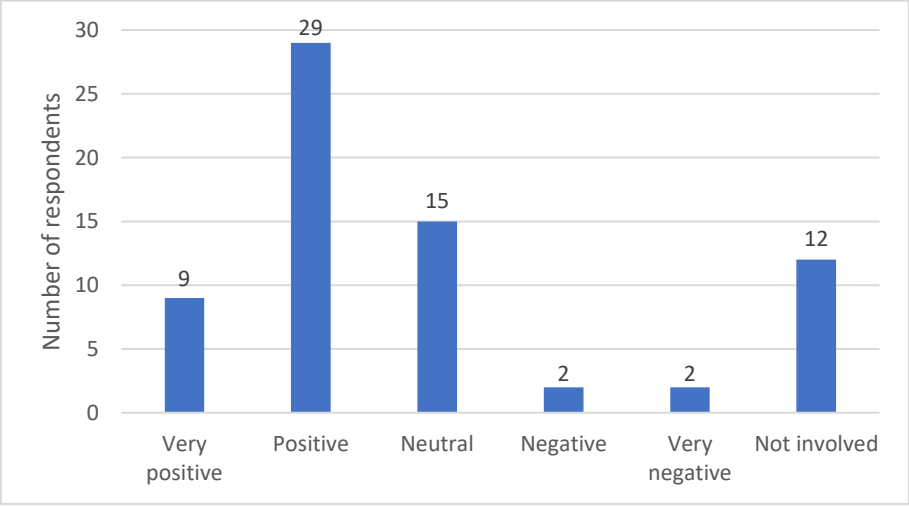

Figure 3. Management support in implementation of action plans. n=69

Some of the participants were colleagues from the same school while other schools had only one representative. We looked at how this influenced the implementation of the action plan. Of the 40 respondents who attended the course with a colleague, 36

(90%) implemented or partly implemented the action plan (Figure 4). Thirty-four (83%) of the 39 respondents who attended the course alone implemented the plan at least partly.

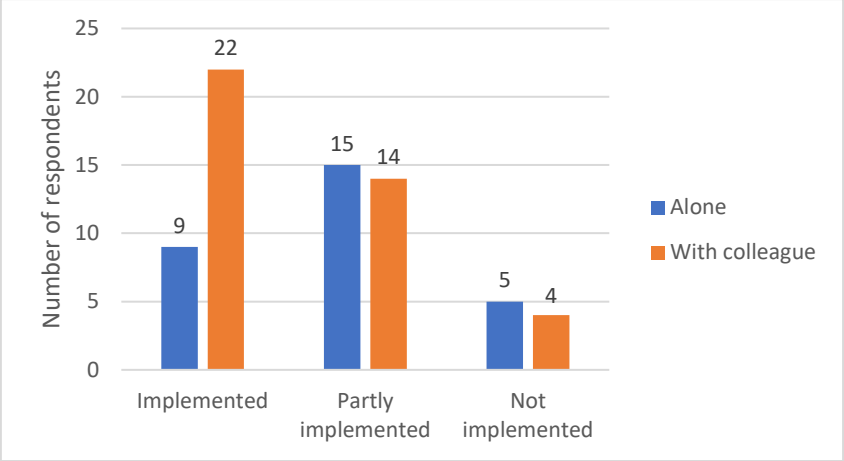

Figure 4. Relation between implementing action plan and attending course alone or with a colleague. n=69

The participants were asked how supportive the management was in implementing the action plan. We thus investigated how management support influenced the implementation of action plans. One respondent reported that the action plan was well received, but it was "eaten up" by all the other things the management had to relate to. Of the 38 respondents reporting a positive management, 37 (97%) implemented the action plan, at least partly (Figure 5). None of the respondents reporting a negative management implemented the action plan.

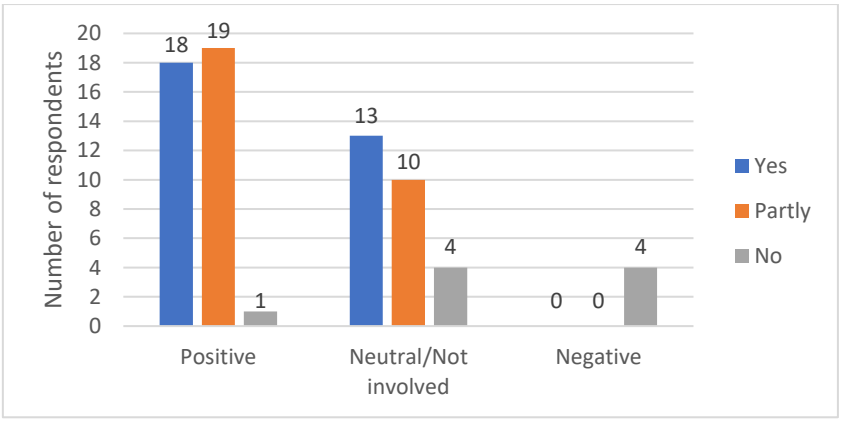

Figure 5. Relation between implementing action plan and support from the management. n=69

While 27 (68%) of respondents attending the course with a colleague reported a positive management, only 11 (38%) of those attending the course alone did (Table 1). A negative management was reported by 5% of those attending the course with a colleague, and by 7% of the remaining respondents.

Table 1
Relation between Support from the Management and Whether Respondents Attended the Course with a Colleague or Alone

	With colleague	Alone
Positive	27	11
Neutral/Not involved	11	16
Negative	2	2

n=69

Challenges in Implementing the Action Plan

The participants were asked to describe their challenges in implementing the action plan. Six main categories evolved with some respondents describing more than one challenge. The largest group had no or few challenges (n=24). Time was the most limiting factor (n=18). Uncooperative colleagues (n=7), challenging students (n=7), and uninterested and negative management (n=5) were mentioned. Some miscellaneous (n=9) challenges were also reported, e.g. one school already had an action plan and other schools reported conflicts with other projects.

It is positive that a large group encountered no or only a few challenges. That time was a limiting factor was not a surprise. At work, there is limited time for creative thinking. Every day has enough challenges (Ask et al., 2018). This result also coincides with the New Zealand Government (2012), which stated that implementing new plans may take time, and it is important to have a longer-time view. Hrebiniak (2008) pointed out that effective implementation takes time and involves people at all levels. For some, the problem was that the time table for the term was already in place, and the management and the colleagues did not see how pedagogical entrepreneurship could be integrated as a learning strategy. One headmaster argued that entrepreneurship was not a priority in the strategic plan for the school.

Implementing the action plans took more time than expected because of inexperienced teachers and colleagues and challenging students. It was also difficult to find colleagues to cooperate with. Some colleagues felt that their allocated time was "stolen" and used for other subjects, and that using pedagogical entrepreneurship gave them extra work. They could not see the value of interdisciplinary work. Some teachers found it challenging to engage and motivate all the students and create good enterprise teams. Students in lower secondary school are not used to working independently, as they do in enterprise teams, and did not always understand how they were supposed to work.

Support in Implementing the Action Plan

Support in implementing the action plan varied among the respondents. Both colleagues (n=16) and management (n=20) were important sources of support. The management provided time, possibility, and resources to work with entrepreneurship. Some respondents (n=13) got support from the management, colleagues, and other relevant persons. More than a fourth (n=19), however, got little or no support, yet one of them replied that they had not missed any support, and two of them had not taken any initiative to implement the action plan.

Most respondents got support from either management, colleagues, or both. This response is uplifting and might have contributed to the high implementation rate.

At the same time, a considerable proportion of the teachers did not get much support. Some implemented the plan, at least partly, without receiving any or much support. Two teachers were given support but failed to implement the plan. One of them struggled to motivate colleagues who did not know entrepreneurship as a teaching strategy, but after a while, other colleagues who knew the entrepreneurial method became involved, which simplified the process. This teacher now uses pedagogical entrepreneurship in several subjects but did not implement the action plan per se. Another respondent got a lot of support from the headmaster, but as the department leader was very negative and the rest of the department was resistant, the action plan was not implemented.

When planning future courses, it will be important to inform both the management and colleagues at the school that part of the course will be to develop an action plan for the school. This plan should build on the common wish of the school to implement or improve pedagogical entrepreneurship. Teachers attending the courses should have a mandate from the management: they do a job for the school not for themselves. In this way the whole school can feel ownership of the plan. This idea coincides with Hrebiniak (2008) who stated that the plan is more likely to be successfully implemented if there is an overlap between planner and implementor. Hopkins (2009) also wrote that if people know how plans work, they develop more realistic expectations of what planning can accomplish.

Experience from other courses was that participants can be inspired during the course, but that very little happens when they return to everyday life. However, the results from this research show that most participants implemented their action plans. Using process evaluation from the CIPP model shows that it is beneficial to use time to develop action plans during the course (Stufflebeam & Coryn, 2014). Furthermore, the course should also teach how to work with the plan so that colleagues can see the benefits of the plan.

Strengths and Limitations of the Study

The authors of this study have been involved in one or more courses. Therefore, the participants are known to them, which can be both a strength and a limitation of the study. A positive relationship might increase the response rate. The participants may want to contribute to research that they are interested in and give something back to the course leader. However, participants with negative experiences, and participants who did not implement their action plan, might refrain from answering because they do not want their lecturers to know that they did not succeed.

Furthermore, the participants attended different courses from 2012 to 2017. The response rate was highest in 2016 and lowest from 2012. This result is not surprising as the probability that a teacher may change e-mail address (e.g. due to changed workplace) increases with time. It is also possible that they had forgotten about the action plan and therefore did not reply. Those teachers who took part in the course in 2017 had not finished the school year when the survey was done, and it is therefore natural that they had not fully completed the plan. The survey is too small to draw any fixed conclusions, but it can give an indication of what are success factors for implementing entrepreneurial action plans in schools.

Conclusion

In this study we have looked at what happened to the action plans from five courses in entrepreneurship. If time is to be allocated for making action plans, it is important that the plans are implemented. If they are put in a drawer or on a shelf, the work is in vain. “What we think, know, or believe is, in the end, of little consequence. The only consequence…is what we do”

(Haines, 1995, p. 61). We believe that this is applicable to other similar courses.

Our research showed that most of the plans were fully or partly implemented. It seemed easier to implement the action plan in full if more teachers from the same school participated in the course and the management was positive. No participants implemented the plan if the management at the school was negative. There is a need for more research in the field to be able to say anything certain about which factors govern the implementation of action plans.

There is also a need for further research on how implementing the action plans can improve entrepreneurial teaching methods in school. More research should be done on the five criteria for the pupils' learning environment that will contribute to increased entrepreneurship activities in schools: (a) stimulation and development of creativity, (b) pupil participation and active learning, (c) interdisciplinary work forms, (d) collaboration between schools and local business life, and (e) productive work. Ultimately, there is a need to include to more teaching about and use of pedagogical entrepreneurship as a learning strategy in teacher training.

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FACTORS HINDERING STUDENTS FROM COMPLETION OF STUDIES WITHIN THE PRESCRIBED DURATION: A CASE STUDY OF THE PUBLIC UNIVERSITY IN NAMIBIA

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Abstract: *The authors investigated factors that hinder completion of the Bachelor of Education degree program within the prescribed duration at the public University in Namibia. The study population was 88 B.Ed. students selected using a simple random sample from the class of 214. The study employed a mixed methods approach. A questionnaire was used to collect both quantitative and qualitative data. Quantitative data were analyzed using descriptive statistics, i.e. frequency and percentage; whereas, qualitative data were analyzed by using thematic approach. The study revealed that a lack of study skills, poor time management, inability to prioritize school work, and lack of a mentoring program were the major factors that hinder student completion of study. The study further revealed that the public university used an improper system of allocating student numbers and has no well-coordinated student support services in place to help students succeed within the given time frame. The study provided crucial information on how students at that public university progress within the framework of the study and recommended that students be provided with a conducive, supportive environment where factors impeding their academic progress are minimized.*

Keywords: impeding factors, degree completion, university students, academic performance

Introduction

Higher education in Namibia started in 1980 when the Academy of Tertiary Education was established. Prior to this, students pursuing higher education went abroad, mainly to South Africa (Magadza, 2010). However, shortly after independence, two independent higher education institutions were established, the University of Namibia (UNAM) and Polytechnic of Namibia (PoN). The University of Namibia was established by an Act of Parliament in 1992 (Act No. 18 of 1992), and its programmes were established to meet national human resources requirement through quality teaching, research, consultancy, and community services with a view to produce productive and competitive human resources capable of driving public and private institutions towards a knowledge-based economy, economic growth, and improved quality of life (Centre for Quality Assurance and Management [CEQUAM], 2011). In support of the objectives of Vision 2030, UNAM plays a significant role in capacity building and human development process with the ultimate goal of balancing the supply and demand in the labour market. Equally, UNAM is expected to provide quality higher education that prepares students to take advantages of a rapidly changing global environment (CEQUAM, 2011). To achieve the goals mentioned above, all four teacher training colleges were merged with UNAM in 2010. This merger was done with a view providing quality teacher education in the country in order to create a sustainable human resources foundation upon which to build a country's development (Magadza, 2010).

The site campus is the second largest teacher training institution in the country and had 900 students and more than 70 lecturers at the time of merging (Magadza, 2010). Since the merger in 2010, the campus has grown significantly, starting

with enrollment of 299 B.Ed. students in 2011 and progressing to 574 in 2017 (UNAM Annual Report, 2017). The attendance register of B.Ed. Honours year 4 students of 2017 academic year showed most of students had registration numbers of 2009-2010 and beyond, but they were still studying at this campus even though they were expected to have completed by 2014. A pattern of not graduating when expected emerged (see Table 1).

Table 1
Degree Completion of Students Who Began Their B.Ed. Studies in 2011, 2012, and 2013

Admittance Date – Expected Graduation Date	Total # Admitted	Number/Percent Who Graduated on Time	Number/Percent Who Did Not Graduate on Time
2011 – 2015	299	192/64.2%	107/35.8%
2012 – 2016	315	203/64.4%	112/35.6%
2013 – 2017	402	359/89.3%	43/10.7%

Literature Review

This literature review covers some educational and psychosocial factors that hinder student study completion on time, and the student support services that can aid students in the completion of their degrees within the prescribed time frame.

Educational Factors

Several specific educational factors hinder degree completion. These factors include study time and hours, attendance, time management, shortage of accommodations, and home background (Jama, Mapesela, & Beyleveld, 2009; Mlambo, 2011; Oswalt & Riddick, 2007; Sikhwari, Maphosa, Masehela, & Ndebele, 2015). Creighton (2007) affirmed institutional experience, goals and commitments, high school rank, and students' perception and pre-entry attributes as factors impeding the completion of study on time among the university students. Other researchers identified political affiliation, student over-enrollment, use of internet, and language competence as causes of low graduation rates at institutions of higher learning (Chukwuemeka, 2013; Fakude, 2012; Hussain, Scott, & Matlay, 2010).

Hard and El-Shaarawi (2007) found that a good match between students' learning preferences and course study led to positive effect on performance. Whereas, Nchungo's (2013) study at the University of Zambia found that academic performance of 67.5% of the students was not affected by not their liking the course of study. However, Nchungo revealed that 95% of students' academic performance was affected by lack of up-to-date books in the library, which caused the students to not meet current academic demands, write substandard research papers, and restricted their thinking to outdated material, thus contributing to poor grades.

Psychosocial Factors

The findings of studies in psychosocial factors identified issues such as motivation, self-esteem, stress, test anxiety, help seeking, academic overload, academic performance, student adjustment to the environment, self-efficacy, mental distress, major negative life changes, and lack social support as elements that can affect students' abilities to complete their studies (Hussain et al., 2010; Malefo, 2000; Sommer & Dumont, 2011). Fakude (2012), however, revealed that students were more affected by the environmental factors than internal factors such as motivation, self-esteem, and stress.

Another study by Jama et al. (2009) indicated that social integration, psychological and academic integration factors affected learning. These factors are the interactions between the individual student and the university environment, including their attributes, motivation, attitudes, skills, isolation, interests, commitments, and intellectual development. These findings support Hijazi and Naqvi's (2006) study that a student's performance is a product of socioeconomic, psychological, and environmental factors. Similarly, Lyttle-Burns (2011) found that lack of family involvement, poverty in community, high rate of mobility, and lack of role models are the major factors hindering student academic success. The effects of social factors on student academic performance in Nigerian tertiary institutions can determine how the student strikes a balance between stressful academic attainment and social activities (Umar, Shaib, Aitusi, Yakubu, & Bada, 2010). This study revealed that the student performance was affected by unstable romantic relationships due to the emotional state they can cause. Anxiety and mental distress affected academic performance of adolescent students (Hussain et al., 2010) as can peer pressure (Nchungo, 2013), and loneliness and adjustment to a new environment (Oswalt & Riddock, 2007).

Student Support Services

Global view on student support services. According to Tinto (2010), student support services (SSS) aim to motivate students toward the successful completion of their studies. They can be in a form of student financial assistance, academic advice, assistance in course selection, basic academic skills, mentoring, and tutorial services among others. He emphasised that the first two years of university are crucial for student retention. Fryer (2014) classified three types of SSS: (a) academic (cognitive support); (b) affective (includes social elements); and (c) administrative (non-academic and technical support). Fryer further urged that most of the support services offered at colleges and university campuses were developed to serve the old-fashioned student population. Therefore, a need to re-evaluate the models of SSS is necessary to suit current situations and needs.

Simpson (2016) categorized support services into three kinds of support: cognitive, organizational, and emotional. Cognitive or academic support focuses on developing students' learning skills including the skills of assessment and feedback. Academic support also includes tutorial services, mentoring programme involving family, basic skills instruction in writing, mathematics, and study skills, academic advising in assisting with course selection, exposure to cultural events, activities designed to assist eligible program in securing admission into graduate and professional programs (Gray, Adams, & Owen, 2014). Organizational support helps students control their studies through effectively managing their study time; keeping up with the pace of the courses; prioritizing school, work, and personal issues; developing motivation and self-confidence; and managing stress (Simpson, 2016). This type of support can also help students with course selection, career advice, skills development, and post graduate planning (Gray et al., 2014; Simpson, 2016). Emotional support is about helping students to deal with the emotional side of their learning and overcome problems that inhibit their academic progress. Through emotional support, students are empowered with skills to overcome problems such as stress, loss of concentration, and effectively sort out personal problems affecting their studies (Simpson, 2016). An emotional learning programme not only improves academic achievement but also increases prosocial behaviours such as kindness, sharing, and empathy; improves students' attitudes toward learning; and reduces depression and stress among students (Durlak,

Weissberg, Dyminicki, Taylor & Schellinger, 2011). Furthermore, effective emotional support services help students develop key skills such as self-awareness, self-management, social-awareness, relationship skills, and responsible decision-making skills.

Another support service that is often overlooked is financial support. Financial support provides an environment for students to learn take advantages of opportunities to grow and succeed (Garwe & Mananga, (2015). Murray (2014) argued that it does little good to have a high number of students at the institutions of high learning without sufficient financial resources to support their learning. Financial resources are essential as support in terms of learning, planning, and execution of any mission. Financial support is critical for students to succeed and reach their intended goals (Borders & Drury, 1992; Gysbers & Henderson, 2001).

UNAM support services. There are two student support offices under the Dean of Students: the counselling support services and the student support officer. Each campus has a student support services officer who deals with general student welfare. The office of student support is aware of many issues that affect students' performances and are willing to share such phenomena; however, there is no conducive environment to share and deliberate on such matters with all stakeholders together (lecturers, student leadership, campus management). In most cases, they only point out critical issues to the right channel to be solved. The biggest hindrance has been timetabling. The timetable is too congested, and the only common free time is after 22:00 hours in the evening during the week or Fridays after 17:00 hours; nevertheless, such free times are too late, and people are too worn-out to do anything. The referral system is nonfunctioning at this campus, and many cases die sophisticated death.

Additionally, the student counselling services office has only two student counsellors who cater to the four northern campuses. However, they have managed to train some peer counsellors for each campus. The commonly faced challenges by students as pointed out by the counselling support service offices include accommodation, finance, career choice, time management, and academic issues. Many students are struggling with accommodation as the campus is not able to provide hostel lodging for all students. Students end up renting or lodging with nearby relatives or friends.

Statement of the Problem

Students at UNAM are expected to perform well academically, to pass all the courses, and to graduate within the minimum required time. Likewise, universities are expected to produce high quality graduates in a timely manner and to have high retention and graduation rates for its students, while at the same time maintain low dropout rates (Fakude, 2012). However, the graduation pattern of this campus for 2015, 2016 and 2017 revealed that B.Ed. students did not graduate within the given time frame (see Table 1). In addition, the majority of B.Ed. year 4 students in the 2017 academic year had registration numbers (admission dates) that were out-dated. This pattern of old registration numbers raised the concern to investigate the reason behind this trend. Furthermore, since the merging of Colleges of Education with the University of Namibia in 2010, no empirical study has been conducted at the University of Namibia, particularly at the target campus, pertaining to the progress, throughput, and completion rates of the B.Ed. students. This lack of data makes the current study on factors hindering the students' completion within the prescribed timeframe relevant.

The research questions were

1. What are the factors that hinder B.Ed. (Hons) students' study completion at this campus?
2. What student support services are available for B.Ed. students to graduate within the given time at this campus?
3. What are the psychological factors hindering B.Ed. students to graduate on time?
4. What are the effects of teaching and learning resources on B.Ed. students?

Methodology

The study adopted a cross-sectional survey design framed within a mixed method research approach that gathered quantitative and qualitative data. The researchers deemed it appropriate to gather data on factors hindering B. Ed. (year 4) student's completion of study on time. Using both closed and open-ended questions made it possible to arrive at richer and more complete description covering all aspects of the phenomenon under investigation. The main reason why the researchers used this form of inquiry was that the combination of qualitative and quantitative approaches provided a more complete understanding of a research problem than either approach alone. Bertram and Christiansen (2015) reiterated that the use of both quantitative and qualitative methods provides more insights and understanding that can be missed if only one method is used.

Population

Wiid and Diggines (2013) defined population as "the total group of people or entities from whom information is required" (p. 186); whereas, du Plooy-Cilliers, Davis, and Bezuidenhout (2014) described the population as a group of people who are the focus of a research study and to which the results would apply. The target population for this study comprised of B.Ed year 4 students of 2017 academic year who were lagging behind in completion of their studies within the prescribed duration of study. The study used a simple random sampling method to select the participants.

Sample and sampling procedures. Sampling is a process of taking a portion from the whole population to represent that population; while, a sample is a selected small collection of units that closely represents features of interests on a larger collection of cases called population (Neuman, 2011). According to Gay, Mills, and Airasian (2011), simple random sampling is a process of selecting a sample in such a way that all the individuals in the defined population have an equal and independent chance of selection for the sample. The participants were systematically randomly selected at the interval of every fifth student. The probability sampling was adopted for this study to allow all students equal and independent chance of selection for the sample. The sample for this study was 88 students out of 214 who were behind in completion of their studies within the prescribed duration.

Data Collection and Ethics

The data for this study were collected using a questionnaire that was given to students to complete independently within one week. The rationale was to accord the participants enough time to complete the survey questions at their own convenience. However, only 33 questionnaires were returned and analysed.

Respondents were informed about the purpose of the study. Participation in the study was voluntary, and they could withdraw at any time. Participants were ensured that anonymity would be maintained throughout the study. Confidentiality was ensured, and only aggregated data were reported. The data were kept secure and only available to other

researchers. The researchers undertook to adhere to the Helsinki declaration, which emphasizes autonomy, beneficence, non-malfeasance, and justice (Bertram & Christiansen, 2014).

Research Instrument

The data were collected using a questionnaire with both closed and open-ended questions. The questionnaire was divided into four sections: Section A – demographic information; Section B – education factors; Section C – support services; and Section D – psychological factors. Demographic, closed-ended questions were used to gauge experience and characteristics; while sections B-D used both closed and open-ended questions to obtain feelings, beliefs, attitudes, and perceptions of participants on factors affecting their completion of study within the prescribed duration. Although open-ended questions encourage the flow of spontaneous responses and allow respondents to write their own opinions without being constrained by closed-ended responses, the researcher may find it difficult to compare responses that have little in common (Cohen, Mannion, & Morrison, 2007 cited in Bertram & Christiansen, 2015).

Results

Data analysis was carried out by first finding out the number of responses for each item or statement on each section of the questionnaire by each respondent. The response scores for each section of the questionnaire of respondents were calculated, and the results presented in tables using descriptive statistics. The qualitative data analysis followed the flow of data reduction, data display, and conclusion drawing and verification. Each researcher coded and analysed the qualitative data individually after a persistent rereading of the data and later compared and agreed on the common findings and themes. Thus, responses from the respondents' own views were analysed using thematic approach. This procedure for data analysis is consistent with the method for identifying, analyzing, and reporting themes within data (Bertram & Christiansen, 2015).

Thirty-three student-participants returned their surveys: ten identified as males and 23 identified as females. Of the ten male participants, two were trainee/students studying lower primary phase; one was a trainee/student in upper primary phase; and seven were trainees/students in secondary phase. With regards to the 23 female participants, 11 were trainees/students in lower primary phase; seven were trainees/students in upper primary phase; and five trainees/students were in secondary phase. As for accommodations, eight males and 10 females indicated that they lived on campus, while two males and 13 females lived off campus. The ages of the participants were as follows: 11 were 18 to 22 years old; ten were 23 to 27 years old; eight were 28 to 32 years old; and two were over the age of 32.

Only two students in the 2013 cohort indicated that their study progress was affected by repeating a module, while 31 students indicated that they were progressing within the duration of time but had been affected by the improper allocating of student numbers (i.e. the student is allocated a student number in the first year s/he applied for the course and not allocated the student number on the actual year of registering the study programme).

Factors Hindering Program Completion

Besides participants' profile, this report examined three factors hindering students from completion of studies within the prescribed duration on this campus. These factors are educational factors, student support services, and psychosocial factors (see Table 2).

Students were asked to respond to the statements stating whether they agree, disagree, or not sure if the item hindered their completion of the program. Using the mean and standard deviations to explain, the data indicate

- Most responses show that they were not sure of the reasons of failure to complete the course on time.
- There is agreement that inability to prioritise academic work and mentoring programs hindered the completion of study.
- The deviations indicate a normal distribution and representation of responses and that there is consensus in the responses. These data show that poor time management has a negative influence on the completion of study at this campus.

Table 2
Educational Factors Hindering Degree Completion

	Disagree	Not sure	Agree			
	Number/ Percent	Number/ Percent	Number/ Percent	Mean	$\sum(x-\bar{x})^2$	SD
Not liking the course	12/36.4%	16/48.4%	5/15.2%	0.9	2.03	0.06
Lack of study skills	23/69.7%	8/24.2%	2/6.1%	1.4	2.5	0.08
Inability to prioritize academic work	17/51.5%	11/33.3%	5/15.2%	1.5	2.8	0.08
Poor time management	27/81.8%	5/15.2%	1/3.0%	1.7	3.5	0.1
Lack of a mentoring program	18/54.5%	11/33.3%	4/12.1%	1.3	9.6	0.29

n = 33

Financial aid was another hindering factor evaluated under SSS (see Table 3). When asked to respond to a question about whether financial support hinders completion of their study, 12 of them said yes, while 21 students said no. The majority of students (63.6%) responded that they do not have financial problems that hinders their academic progress mostly because the *Namibian Students Financial Assistant Fund* (NSFAF) funded their studies. Some of students indicated that their parents were paying for their studies. However, 36.4% of students indicated that financial difficulties hampered their academic performances because most of the time, they worried about having enough money to pay for their studies and food. In addition, some students also revealed that their studies were affected by unsupportive parents. Most parents have low income level that could not afford to pay for higher education training of their children. One student said, "My parents are not working, and I do not have a study loan.

Regarding the question whether lecture halls hinder their study completion, only 15 (45.5%) students out of 33 students said they were affected by quality of lecture hall because of the large number of students in one lecture hall (e.g., 300 students to one lecturer without proper sound equipment). Those who indicated that lecture halls hinder their study completion cited that congested lecture halls prevent them from hearing the lecturer presentations and seeing notes in the slides. These students suggested that small classes would accelerate their efforts in attaining the educational goals as lecturers would have time to individually assist them, especially those that are struggling to learn.

When asked about the campus accommodation availability, 33.3% of the students indicated "yes" that the lack of campus accommodation affected their learning, and 66.7% of students said that their study was not affected by lack of accommodation on campus. However, one student claimed that accommodation was one of the major factors that hindered

completion of study. This student said, "I failed my first year because I was not accommodated in the university hostel. I used to commute and travel 30 km every day, and sometimes I did not have taxi money. But, now that I am in the hostel, I am passing with flying colours."

On the question whether counselling services hinder their completion of study, 7 (21.2%) students indicated "yes", while 26 (78.8%) said "no". Most of the students indicated that their study completion was not affected. However, a sizeable minority of students (21.2%) believed that counselling services at this campus really affected their completion of study. One student said, "I had problems in my first year, and I suffered in silence as I was not aware that there were counselling services for students on campus (see Table 3).

Table 3
Student Support Services Affecting Program Completion

	Number/Percent of Responses				
	Yes	No	Mean	$\sum(x-\bar{x})^2$	SD
Did your financial support hinder your completion of study?	12/36.4%	21/63.6%	0.9	2.03	0.06
Did lecture halls affect completion of your study?	15/45.5%	18/54.5%	1.4	2.5	0.08
Is lack of campus accommodation hindering completion of your study?	11/33.3%	22/66.7%	1.5	2.8	0.08
Is counselling services hindering the completion of study?	7/21.2%	26/78.8%	1.7	3.5	0.1

n = 33

When asked to share their opinions on the campus orientation program, four students rated the program as excellent, 13 students rated it as good, and 16 students rated the orientation program as weak. The students who rated it as weak suggested improvement on the content and organization of the program. They felt that more information on course selection (i.e. pre-requisite modules) should be discussed during the orientation program and touring of the whole campus for students to know where to find lecture halls is highly commendable (see Table 4).

Table 4
Ranking of Student Orientation Program

	Number/Percent of Responses					
	Excellent	Good	Weak	Mean	$\sum(x-\bar{x})^2$	SD
How do you rate the student orientation program?	4/12.1%	13/39.4%	16/48.5%	1.3	9.6	0.29

n = 33

Two other support services were assessed by the participants: the library facilities and the internet capability on campus. Regarding the library facilities affecting their study completion, many students said no; however, a small number of students said that the library facilities affected their completion of study because there are no up-to-date books, journals, or materials on the library shelves. The students further indicated inadequate access to library computers due to insufficient number available. More than fifty percent of students said that the internet facility really affected their completion of study. They specified that internet was unreliable or "off" most of the time, and this unreliability delayed the submitting of their assignments on time or finding relevant articles online to review for tests and examinations.

Psychological factors. These factors included stress management, lack of motivation, and peer pressure. When asked to respond to whether lack of stress management affected their completion of study, 14 (42.4%) students said "yes", while 19 (57.6% students said "no". Although not a majority, a considerable number of students expressed that they lack stress management skills, and that lack affected their learning progress. Students felt that stress distracted them from learning and eventually hampered their academic success. Lack of motivation hindered nine (27.3%) of the students; whereas, 24 (72.7%) of the students said that their study was not affected by lack of motivation. However, more than a quarter of students shared that they needed someone to push them to study as they are used to the micro-management and high school teachers' control. When asked if peer pressure affected their completion of study, 14 (42.4%) students gave a "yes" response, and 19 (57.6%) students gave a "no" response. More than a third of the students showed that they were easily influenced by peers, and they did not have self-regulatory system to drive their own studies. As a result, their study completion is affected.

Other factors noted by participants. When they were asked to share any other factors that affected their study completion, students mentioned delayed course outline provision, shortage of study guides, congested examination timetable, student-lecturers ration, and interpersonal relations between students and some lecturers as factors that affected their completion of study on time. Students felt that they needed lecturers to avail themselves so that students can openly engage with them on personal issues affecting their learning. They said lecturers need to encourage students to do well in their studies and have time to have individual discussions with students who are struggling with learning.

With regards to the overall recommendations to enable students to complete their studies on time, students specified more lecturers should be appointed; some modules' content should be reviewed; students should be given time management and stress management skills training, especially the first year students; study guides should be available for all subjects; and counselling services should be provided to help students set priorities and instill self-motivation. The respondents further recommended that students be given enough time to prepare for the examinations, lectures to encourage and private talks with struggling students, and invite motivational speakers (especially the alumni) to address them on issues affecting university fraternity.

Discussion

The survey aimed at exploring the views of B.Ed., year four students. The survey was administered during the 2017 academic year focusing on issues affecting the students' completion of study within the prescribed time.

Educational Factors

In this study, educational factors were more prevalent in influencing students' academic achievement than psychosocial and student support services. Most of the students indicated lack of study skills, inability to prioritize academic work, poor time management skills, poor mentoring program, and unreliable internet facility as hinderances to their learning progress. Students who lack time management and study skills could become disorganized and uncertain of their goals and priorities. These factors could lead to an inability to effectively budget and manage their time. These findings are supported by both Nchungo (2013) and Fakude (2012) who found out that students who are unable to manage their study time tend to procrastinate and neglect their study responsibilities. This tendency affects their

study and the quality of their work and eventually fail to complete their studies.

Student Support Services

The study found that some students experienced financial difficulties, congested lecture halls, and lack of accommodation as stumbling blocks towards the completion of their studies. Although financial issues were not the main factor for this study, in general financial challenges distract university students from academic success and undermine university affordability and completion. Those students who enrolled for study without having funding confirmed that their days were consumed by worries about sponsorship. However, when financial aid helps cover tuition fees and other costs, students could then spend more time in class and studying instead of engaging in unproductive activities. Sikhwari et al. (2015) opined that with excessive worry about financial problems, students might find it difficult to concentrate on their studies. Consequently, their work could be mediocre, or they could miss assignment deadlines and eventually end up failing the courses. Financial problems lead to some students to make difficult choices, like dropping out of the university. The student's main priority was to secure financial aid before focusing on academic activities. Only once they were able to deal with this stumbling block did they shift focus to their studies. Financial resources are essential as support of people in terms of learning, planning, and execution of any mission These results are further supported by other studies that stated financial aid, family income, socioeconomic status, and parental involvement and guidance as contributing factors to students' low academic performance (Jama et al., 2009; Mlambo, 2011; Oswalt & Riddock, 2007).

Accommodation availability to students was a main concern for the students in this study. Many students in this study could not find hostel accommodation on campus due to limited space. In retrospect, there is only one teacher training institution in the overpopulated area; therefore, the institution is unable to cater for the high demand of student accommodation. Other researchers have discussed that lack of accommodation can negatively affect academic performances (Ali, Haider, Munir, Khan, & Ahmed, 2013; Hijazi & Naqvi, 2006); Mushtaq & Khan, 2012).

Psychosocial Factors

The study further revealed that lack of stress management skills, intrinsic motivation, and peer pressure were some of the psychosocial factors affecting their study. Although it is common for people to have stress in their lives, failing to manage that stress effectively might cause people not to achieve their goals. Peer pressure puts demands on students to help their friends even at the cost of bunking classes, going out with friends during academic activities, or completing the other's assignments while missing their own. This kind of behavior may negatively affect their learning and eventually their completion of study on time.

The literature maintains that stressful academic situations impact the performance of students (Oswalt & Riddock, 2007). If stress is not managed properly, it can prevent students from successfully achieving their academic goals. Moreover, if students are unable to manage and complete their work in the set time, it could cause them greater stress and feelings of being overwhelmed. In the end, this high level of stress could lead students to become disorganized, uncertain of their goals and priorities, and subsequently lead to inability to effectively manage their study time. Similar to the results of this study, other studies identified motivation, self-esteem, stress, test anxiety, academic overload and performance, students' adjustment self-efficacy, mental distress, high negative life change as psychological

factors that impede learning (Malefo, 2000; Sommer & Dumont, 2011).

Conclusion

Students are affected by many problems that hinder completion of their studies. The prominent problems were poor time management skills, lack of study techniques, and a shortage of accommodation. Students are not making effective use of support services or are unaware of the availability of student support services. In addition, delay of course outline provision, shortage of study guides, repetition of modules, congested examination timetables, student-lecturers ratio, and interpersonal relations between students and some lecturers affected students. The study further proved wrong the assumption that students were lagging behind because of their delayed student numbers; nevertheless, their student numbers only reflected the year they first applied to UNAM, not the year they were began those courses, and as such had no effect on their study completion dates.

Recommendations

The following recommendations are suggested to solve the problems and limitations that are responsible for students' delay in graduating within the expected time frame. These recommendations are useful for both administrative and academic point of view.

- The university management will be made aware of some factors that hinder students from completing their studies on time (i.e., inadequate library resources, poor internet services, overcrowded lecture halls, insufficient utilization of student support services, and poor time management).
- The current orientation program could be reviewed and strengthened to better cater to students' success by helping students who are lacking study skills and prioritizing their academic work.
    - Workshops should be organised regularly for alumni to share experiences on how to study, how to manage time, and on how to seek student support services.
    - An online consultation with students can be established.
- Concerning accommodation, the researchers recommend that UNAM management build more hostels lodging for students.
- There is a strong need for strengthening the student support services to guide the students and assist them to cope with university life. The student support services office should also work closely with lecturers to engage each other on how best to support students who are struggling with their studies.
- The teacher educators will be encouraged to conduct more individual consultations with those students who need assistance.
- It is suggested that the examination bodies review both the examinations and classroom timetables to be more accommodating for students.
- Regarding students' numbers, it is recommended that UNAM should have two data input systems. One to record all applications, and another to allot students' numbers based on the year admitted for that course, in that way, students who are lagging in their studies could be easily detected and be assisted to complete on time.

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These institutions' logos appear on the front cover of this issue: Joetsu University of Education, Japan. It sponsored the ISfTE seminar in 2018. sponsored the ISfTE seminar in 2017. The other institutions – University of Aarhus University, Denmark, Weber State University, USA, and Brock University, Canada – support JISTE with their on-going sponsorship and/or the support of the work of the editors and officials of ISFTE. If other institutions would like to help sponsor *JISTE*, please contact the journal's editor, Karen Berg Petersen.

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