

## 4. 本学学生に対する本プロジェクトの取組

本学学生に対する本プロジェクトの取り組みとして、(1) 大学教員の ICT 利活用の支援と教員養成における ICT 活用指導力の育成にむけた学生 ICT 支援員体制の構築と、(2) 教員養成の ICT 活用指導力の育成を目指した教材の開発と授業を実施した。

(1) 大学教員の ICT 利活用の支援と教員養成における ICT 活用指導力の育成にむけた学生 ICT 導入支援員体制の運用

平成 29 年度に構築した大学教員の ICT 利活用の支援と教員養成における ICT 活用指導力の育成にむけた学生 ICT 支援員体制を引き続き運用した。今年度は新しく AL ルームを実施した。AL ルームについて以下の論文で報告した。論文を添付する。

- ・ 正木香・梅田恭子・齋藤ひとみ, アクティブ・ラーニング推進のための ICT 機器とコミュニケーション・ツールを試せる AL ルームの開催について, 愛知教育大学 教職キャリアセンター紀要 Vol.5 pp.225~229, March, 2020

(2) 教員養成の ICT 活用指導力の育成を目指した教材の開発と授業を実施

教員養成の初年次向けに ICT 活用指導力の向上と、教員として役立つ主体的・対話的で深い学びを学ぶことを目的とした教科書およびワークシートを作成し、1 年生の必修の共通科目「情報教育入門」の実践を行った。またこれらの結果を以下の学会で報告した。論文と発表スライドを添付する。

- ・ Hitomi Saito and Kyoko Umeda, The Development of Teaching Skills Using ICT in Teacher Training: Practices in First- Year Introduction for ICT, ICEMT 2019: Proceedings of the 2019 3rd International Conference on Education and Multimedia Technology, 120-125, 2019

**授業科目:** 情報教育入門 (1 年生必修共通科目) (全 19 クラス 911 名)

**開催日時:** 2019 年 4 月-2019 年 8 月

**開催場所:** 共通棟 3 階 310-312 教室・303 教室

**学習目標:** (1) ICT 活用指導力を学ぶ際に、情報活用能力を用いながら学ぶ  
(2) 教員として役立つ「学び方」を学ぶ

**授業内容:**

回	内容	回	内容
1	学習目標、PC の基本操作	9	授業における ICT 活用 2 (ポスターツアーによる発表)
2	学び方について、協同学習の準備	10	校務の情報化 1 情報セキュリティ
3	教育の情報化	11	校務の情報化 3 表計算によるデータ処理
4	校務の情報化 2 (電子メール)	12	情報モラル教育 1
5	情報教育 1 (インターネットでの情報収集)	13	情報モラル教育 2 (ミニ授業)
6	情報教育 2 (情報の整理・まとめ)	14	おわりに
7	情報教育 2 (ワープロソフト)	15	演習
8	授業における ICT 活用 1	16	期末試験 (e-learning)

# アクティブ・ラーニング推進のための ICT 機器とコミュニケーション・ツールを試せる AL ルームの開催について

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## Providing Trial Space for ICT Equipment and Communication Tools to Promote Active Learning

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Keywords : アクティブ・ラーニング授業推進 ICT 機器活用

### I はじめに

2020年度からの学習指導要領の中では、主体的・対話的で深い学び（アクティブ・ラーニング）の視点から「何を学ぶか」だけでなく「どのように学ぶか」も重視して授業を改善することが求められている[1]。愛知教育大学では、大学の授業ではもちろん、教員養成教育の立場から、学生が教員になったときに、自らがアクティブ・ラーニングを導入した授業を実践できるような取り組みを行っている。

### 1 アクティブ・ラーニングについての本学での取り組みと現状

愛知教育大学では、『「主体的・協働的な学び」を実践できる教員の養成ーアクティブ・ラーニングを導入した新たな学習指導方法の開発ー』プロジェクト（以下、ALPJと略す）を中心に、①アクティブ・ラーニング授業が実践できる教員養成プログラムの開発、②アクティブ・ラーニング授業が実践できる現職教員研修プログラムの開発、③アクティブ・ラーニング授業が実践できる大学教員の養成プログラムの開発、④アクティブ・ラーニング授業の指導方法・教材の開発、アクティブ・ラーニング授業の推進・拡充を通して、主体的な問題発見能力や能動的な学修活動能力を育成することを目的として、全学的な活動を展開している[2, 3, 4]。この中で、学内の教員や学生、一般に向けたものとして、アクティブ・ラーニング実践のためにFD講演会を行ったり、授業で使えるiPad等のICT機器とまなボード（ワークシートを透明なシートの下に挟んだり、ホワイトボードのように書いたりできる持ち運び可能なボード）などをALPJで管理し、教員からの依頼で貸し出したり、必要に応じて学生ICT支援員を授業に派遣したりする活動を行っている。

本報告では、特に④のアクティブ・ラーニング授業

の推進・拡充を目的としたALPJの4年目に始めた活動について報告する。

### 2 ALPJ 所有の機器類の利用の現状

ALPJでは、昨年度まで、主にiPad50台、教師機として利用するためのSurface2台、プロジェクター、無線LANのアクセスポイント、まなボード50枚などを所有し、貸し出してきた。

昨年度のこれら機器類等の貸し出しで見ると、表1のとおり、ICT機器およびまなボードは、いくつかの授業で、定期的に使われている。しかし、表2を見ると、ICT機器を借りた教員は8名、まなボードを借りた教員も6名だけである。まなボードを借りた教員のうち、ICT機器も借りた教員もいるため、全利用者は12名にすぎない。これらの教員が、何度も繰り返し使っているだけであった。また、模擬授業のため、教員を通じてICT機器を借りた学部・大学院の学生も7名で、その担当の教員は3名に過ぎない。まなボードについては、2名の学生が借りたが、その担当教員は1名だけであった。

貸出し物品	授業数	コマ数
ICT 機器類	16 授業	91 コマ
まなボード	11 授業	32 コマ

表1 2018年度の物品貸出し回数[4]

※学生が教員を通じて模擬授業準備、卒業研究等のために借りたものは除く

貸出し物品	利用者	人数	コマ数
ICT 機器類	教員	8名	91 コマ
	学生	7名	34 コマ
まなボード	教員	6名	32 コマ
	学生	2名	5 コマ

表2 2018年度の物品利用者[4]

これを見る限り、まだまだ、学内で、ALPJ が授業で使えるような iPad など ICT 機器類や、まなボードを貸し出していることを知っている教職員が少なく、さらに学生については、教員が知らなければ、このような貸し出しを行っていることを知るチャンスもないため、ほとんどの学生は知らないと思われる。たまたま、自分の取っている授業で ALPJ の iPad やまなボードを使う機会があっても、その授業内だけで終わってしまうことが多い。学生は、教員を通じてしか借りられないため、学生が ALPJ の物品を借りて、自分の勉強のために使える機会は非常に少なくなると考えられる。

もし、これらの物品の存在を知っていて、借りられることを知っていても、何に使えるのか、どのように使ってよいかかわからないので、一部の教員や学生にしか利用されていないのではないかと考えた。

また、昨年度末に iPad を 10 台追加し、今年度から貸し出せる iPad は合計 60 台とし、さらに、Apple TV など、授業で iPad をより使いやすくする機器類の貸し出しをはじめた。このことにより、同時に 2 つ以上の授業でも貸し出し対応できる場合が増えたと考える。また、充電のやりくりも改善したと思われる。

今年度から新規に貸し出しを始めた Apple TV は無線でプロジェクターなどにつながられるため大変好評で、学内で iPad を利用した授業を行う際には、貸し出し開始後、ほぼすべての案件で貸し出しになるほどである。今までのように iPad にアダプターとケーブルをつないでプロジェクターへつなぐ方法は、ケーブルの重さと長さを使い勝手が縛られるため、ほぼ Apple TV に置き換わってしまった。

### 3 ICT 機器を利用したアクティブ・ラーニングについての、教員や学生の意識

教員を対象にした平成 31 年 3 月実施のアンケート(回答数 288) [5]では、アクティブ・ラーニングの要素を含んだ授業を行っているとした教員は 95.1% (回答数 274) と高いが、アクティブ・ラーニングを取り入れた授業の実施率は、学部で 71.2%、大学院で 78.5%である。そのうち ICT 機器の効果的活用をした授業を行っているとしたのは、274 人中 96 人にすぎない。アクティブ・ラーニングを実践するために、ICT 機器を必ずしも使う必要はないが、まだまだ、授業に使える ICT 機器等の貸し出しを行っていることを知らない、知っていてもどう使っていいかわからないから使わない、という教員が多いことが、ここからもうかがえる。

実際に、せっかく使えるのだから ICT 機器を授業で取り入れたいが、いきなり授業をするのは、困難であるという相談もいただいた。また、教員を通じて模擬授業のために借りていった学生からは、ICT 機器を借りて模擬授業をするのは、準備が思うようにできず、かなりハードルが高いという意見も聞いた。

### 4 学生 ICT 支援員不足の現状

ICT 機器類をいきなり使った授業では、はじめ、機器類の操作などに学生が慣れていないため、操作の説明だけでかなり時間をとられてしまうことがある。そのハードルを少しでも下げるため、ALPJ では、学生 ICT 支援員を組織しているが、2019 年 4 月の時点で、昨年度から継続して活動している学生 ICT 支援員

は、4 年生ばかりで 13 名であった。発足当初は、2 年生以上で、教員養成課程初等情報選修・中等情報専攻、現代学芸課程情報科学コースを中心に募集していた[6]ことも理由であると考えられる。昨年度までは、学生 ICT 支援員発足当初から活動していた学生が多く、現代学芸課程情報科学コースは募集が 2016 年度までしかなかったため、今年度は 4 年生しかいないことが大きな原因であると考えられるが、4 月の時点では、その現代学芸課程情報科学コースの学生が中心となっていた。

今年度 4 月からは、全ての学科を対象とし、1 年生も応募可能として募集したが、新たに活動を始めた学生は、3 人だけであった。

登録している学生は、当然授業があるため、自分の授業に支障のない時間帯でしか活動できない。そのため、授業支援に入れる学生は常に不足しがちである。

## 5 お試し AL ルームの企画

上記のような現状をふまえて、大学内の教職員、学生全ての人に、ALPJ の活動を広く知ってもらい、もっと所有する機器類を有効活用してもらうための活動が重要だと考えた。

そこで、ALPJ 管理の機器類を活用した授業をもっと多くの教員が行えるよう、また、学生が模擬授業で取り入れやすいように、自由に iPad やまなボードなどを実際に触って、授業の準備を行えるような機会を AL ルームとして定期的に設けることにした。

機器と人材を有効活用した機器類体験可能の場を設けるにあたり、まずお試し期間を設け、後期以降に本格実施をするための足掛かりとした。

## II お試し AL ルームとしての実践

### 1 概要

(1) 期間  
期授業期間 (2019 年 5 月 23 日 (木) ~ 当初予定 7 月 29 日 (月)、8 月 9 日 (金) まで延長)  
月曜 3 限 (13:20~14:50)  
木曜 2 限 (10:50~12:20)  
及び、要望があった時間

(2) 実施場所  
教育交流館 1 階 ラーニングコモンズ I  
学生の人通りが多く、気楽に入ってもらえるよう、目につきやすい場所で、学内の Wi-Fi が利用できる場所を選んだ。

(3) 利用対象者  
本学の教職員 (非常勤も含む)、および学生。  
今年度から、貸し出し対象を本学の教員 (および教員を通じて借りる学生も含む) だけから、非常勤も含んだ教職員として、対象者を増やした。

(4) 利用可能物品  
・ iPad 5 台  
・ タッチペン 5 本  
・ ノート PC 1 台  
・ iPad 用 USB メモリー 1 個  
・ まなボード 5 枚  
(他にラーニングコモンズ I に備え付けの大型ディスプレイ、ホワイトボード)

(5) 人員  
研究補佐員 1 名および事前に実験等の要望があった場合は学生 ICT 支援員 1、2 名も加わった。

## (6) 利用方法

気軽に立ち寄ってもらい、iPad やまなボードに触ってもらうために予約は不要とした。

## (7) その他

どのようなニーズがあるのか探るため、来場者にアンケートをお願いし、また要望や意見を聞いて、後期以降、本格的に実施するための足掛かりとした。

## 2 成果等

### (1) 利用者数

教員のべ4名

学生のべ23名

### (2) 教員の来場の目的

教員のお試しALルームへの来場の目的の内訳は、学習支援ソフトの使い方の事前講習や、授業での利用の方法、無線LANが使えず、有線LANが1本しかない教室での授業の行い方についての相談と検証などであった。お試しALルームに来場後、実際に、iPadの学習支援ソフト(ロイロノート・スクール)を利用して、いくつかの授業で何度も使ってくださった。さらには、現職の教員も多く受講している講義などで、授業支援システムやiPadの利用について、有効性を広めてくださった。

### (3) 学生の来場の目的

学生がお試しALルームへ来場した目的は、自身が受講している授業での、模擬授業の準備や、夏休み等に行われる講習会の支援員としての参加のため、授業支援ソフトの事前講習、アクセスポイントの設置方法の確認などであった。

### (4) 効果等

新たにiPadや授業支援システムを使って授業を行ってくださる先生が増えたことは、新たな使い方にもつながり、学生の学習環境をより効果的にし、さらに学生が実際に教員になった時の参考になるので、今後も先生方への支援を積極的に行っていきたいと考える。

また、学生の利用のうち、模擬授業の準備のためにお試しALルームに来場するようになったことは、教員の手間をかなり削減したと考えられる。

お試しALルームを行う以前の手順は、以下の流れのとおりであった。

1. 学生は教員に、物品貸出し希望を伝える
2. 教員が、メールでALPJ物品の貸出しの申し込みをし、予約する。
3. 教員が鍵を借りて、保管庫から物品を借り出し、学生に渡す。
4. 学生は、研究室等で物品を利用する。
5. 学生は教員に物品を返す。
6. 教員は、鍵を借りて、保管庫へ物品を返却する。

学生は教員を通じてしか、物品は借りられないので、学生と教員の双方の都合がつくときしか借りることができなかった。授業によっては、担当の教員は、模擬授業を行うグループごとにこの手続きを何度もふまねばならず、相当の手間を要したと考えられる。

しかし、お試しALルームで模擬授業の準備を行えるようになったため、教員は、授業でお試しALルーム開催の日時と場所を学生に周知すれば、あとは、特に何もしなくても学生は模擬授業の準備を行えるようになった。

学生は、お試しALルームの毎週定期の開催日時であれば、自分の都合の良い日に予約なしで、iPad等が利用できるため、準備作業をする場所を確保する必要もなく、先生にお願いしなくても、何度でも利用できるようになり、利便性は上がったと考えられる。なお、授業などで開催予定日の中では都合がつかなかった場合は、希望すれば、定期の開催日以外にも極力対応するようにしたため、特に不便はなかったと考えられる。

このように模擬授業でALPJの物品を利用する教員と学生双方にとって、利便性は向上したと考えられる。

また、教員や学生ではないが、職員から会議での利用のためのiPadの利用申し込みもあり、少しは、ALPJのiPad等の機器類の存在が認知され、幅広く利用されるようになってきていると感じた。職員にも存在を知ってもらえば、教員への紹介なども期待できると考える。今後も、授業等での利用のない限り、対応していく予定である。

さらに、主に夏休み期間中に行われる、学外の現職の教員を対象とする講習会の支援準備のために来場した3年生以下の学生に、授業支援システムの講習を行い、学生ICT支援員に勧誘したところ、新たに6名の学生が学生ICT支援員として登録し、その後も授業支援やICT機器類のメンテナンス作業に参加している。

この点についても、成果があったと考える。

## 3 課題等

お試しALルーム開催期間内に、お試しALルームの利用者の様子や、ALPJ物品の貸出しを行ううちに、明らかになった課題がいくつかある。

まず、学外へiPadなどを持ちだし、活動することが求められる授業で、今年度は、iPadは先生と教務課でまとめてiPadを借り出して、教務課から学生へ貸し出すという流れをとっていた。学外での活動日だけでなく、前後一日を含めて貸し出し期間として貸していたが、このため、iPadは空いているのに、充電が十分できず、他への貸し出しへの準備が困難になる場合がでてきた。また、定期的にICT機器はOSのアップデートなどメンテナンスを行っているが、一斉メンテナンスのタイミングを計るのが難しくなった。

## Ⅲ 夏休み中のALルームとしての実践

夏休み期間中、前期のお試しALルームの結果をふまえて、継続して、ALルームを行った。

後期へ向けて、夏休み中という時間に余裕のある時に先生方の利用があるのではないかと考えたことと、教育実習に参加する3年生が、小中学校でも使われているiPadを使って授業をすることも考えるのではないかと考えたからである。

### 1 概要

#### (1) 期間

夏休み期間(2019年8月19日(月)~10月18日(金))

月曜 14:00~15:30

木曜 10:00~11:30

#### (2) 実施場所

教育交流館 1階 ラーニングcommons I

#### (3) 利用対象者

本学の教職員（非常勤も含む）、および学生。

#### (4) 利用可能物品

- ・iPad 5 台
- ・タッチペン 5 本
- ・ノート PC 1 台
- ・iPad 用 USB メモリー 1 個
- ・Apple TV
- ・まなボード 5 枚

(他にラーニングコモンズ I に備え付けの大型ディスプレイ、ホワイトボード)

利用可能物品に、Apple TV を加えた。

#### (5) 人員

研究補佐員 1 名

## 2 成果等

後期授業までも途切れずに開催したほうがよいかと  
考え、夏休み期間中も継続したが、来場者は教職員、  
学生とも 0 であった。

この間には、AL ルームの時間と場所を使って、前  
期から、先生や学生から質問等が出ていたアプリの機  
能についての検証や、授業支援システムの運用の仕方  
を検討するための検証などを行った。他にもより便利  
に使うための接続試験などを行うことができた。

また、簡易なメンテナンスや、今後必要となるアプ  
リのインストール作業なども行えた。iPad など一斉  
にメンテナンスを行えなくても、少しずつでもメンテ  
ナンス作業を行うことにより、一斉に行わなくてもよ  
い作業はある程度行えたので、AL ルームとして定期  
的に開催したことには、一定の成果はあったと考  
える。

## IV 後期の AL ルームの実践計画

前期のお試し AL ルーム、夏休み期間中の AL ルーム  
の様子を踏まえ、後期も引き続き、AL ルームを行う  
こととした。開催曜日・時間は、授業時間割を考慮し  
て変更することとした。

また、来年度から始まる小学校プログラミングに向  
けた簡易講習会を AL ルームの開催時間と場所を利用  
して、行うこととした。

### 1 概要

#### (1) 期間

2019 年 10 月 21 日 (月) ~ 2 月 7 日 (金)

ただし、11 月 21 日 (木) ~ 12 月 24 日 (火) につ  
いては、後述の簡易講習会を行うため、通常の AL ル  
ームは行わないことにした。

火曜 3 限 (13:20~14:50)

金曜 3 限 (13:20~14:50)

及び、要望があった時間

#### (2) 実施場所

教育交流館 1 階 ラーニングコモンズ I

#### (3) 利用対象者

本学の教職員（非常勤も含む）、および学生。

#### (4) 利用可能物品

- ・iPad 5 台
- ・タッチペン 5 本
- ・ノート PC 1 台
- ・iPad 用 USB メモリー 1 個
- ・Apple TV
- ・まなボード 5 枚

(他にラーニングコモンズ I に備え付けの大型ディス  
プレイ、ホワイトボード)

利用可能物品に、Apple TV を加えた。

#### (5) 人員

研究補佐員 1 名

## 2 成果等

(1) 利用者数 (2019 年 11 月 19 日 (火) 分まで)  
学生 1 名

(2) 来場の目的

iPad を利用して模擬授業を行うための、準備およ  
び、接続確認、動作確認等。

## 3 簡易講習会の計画

来年度から、小学校でプログラミングの授業が始ま  
り、全ての先生がプログラミングを教えられるよう  
になることが求められている[7]。特に現在 4 年生で来  
年度から教員になる学生は、就職してすぐに、必要に  
迫られるが、プログラミングに関連するような必修科  
目は、情報専攻・選修、数学専攻・選修、技術専攻の  
学生以外にはない。その他の学生は、1 年次に必修の  
情報教育入門の授業で 1 時間程度、簡単なプログラミ  
ングを経験しているだけである。

そこで、小学校プログラミングの授業を自信をも  
てできる手助けとなるよう、30~60 分程度の簡易講  
習会を行い、自習、意見・アイデア交換を行える場を  
提供することとした。また、iPad は小中学校でも導  
入されている学校があり、iPad の操作自体に慣れる  
ことも学生にとってはプラスになるのではないかと考  
えられる。

また、この講習会を行うことにより、AL ルームの  
活動や、ALPJ が iPad などの物品を所有し、学生にも  
貸し出せることを知ってもらい、プログラミング以外  
でも ICT 機器等を利用した授業について考え、取り組  
む良いきっかけになることを期待している。

さら学生 ICT 支援員の中でも、特に教員養成課程の  
学生は、講師を体験でき、自身の経験を積める良い機  
会にもなり、また、特に現代学芸課程情報科学コース  
の学生は、もっているプログラミングの知識で、いろ  
いろなプログラミングについての質問にも答えること  
ができるのではないかと考える。学生 ICT 支援員の中  
でも、お互い得意な分野を生かし、また良い刺激を得  
て、今後の役に立つと考える。

#### (1) 概要

開催回数：全 11 回 (予定)

うち 2 回は、本学の情報教育講座の教員が担当す  
る。残り 9 回は、その講習会に出席した学生 ICT 支援  
員が 2~3 人で、先生の講習会を参考にし、講習会を  
行う。毎回内容が同じではないので、興味のある学生  
は、何度参加してもよいこととした。

基本的には、AL ルームの時間と場所を利用して行  
う予定である。AL ルームと同様に、気軽に参加して  
もらえるよう、事前予約なしで参加可能とし、持ち物  
も不要とした。多くの幅広い学科の学生が参加し、意  
見交換をし、小学校プログラミングについて考えるき  
っかけとなることを期待する。

## V 考察とまとめ

今年度、新たに始めた AL ルームであるが、いろい  
ろ模索しながら、より使いやすいものにしていく

とを目指している。

AL ルームは定期的開催しているが、来場者が全くいない日も多い。しかし、そのような場合には、OS やアプリのアップデート作業などを行うことにしている。今までは、OS のアップデートなどは2か月に1回ほど、メンテナンス作業としてまとめてアップデートしていたが、AL ルームでこまめにアップデートを行え、その作業時間が削減できるという利点もある。

また、貸出し手続きについて、さらに改善できる点が残っているので、利用者の意見を聞きながら、よい仕組みを考えていきたいと思う。

### 1 新たな利用者発掘

約半年間 AL ルームを開催してきたが、ICT 機器等を使って新たな授業形態を模索する先生や学生を発掘するのはなかなか困難である。小学校プログラミング簡易講習会のような、企画を通じ、学生に AL ルームへ足を運んでもらうきっかけを作り、iPad を使って模擬授業などを行ってみようという学生をサポートできるように、学生 ICT 支援員とともに知識とスキル向上を試みたい。

### 2 メンテナンス作業・貸し出しについての改善点

今年度、前期に貸し出しについての問題点がわかったので、来年度同じ授業で、同じ問題を生じさせないように、AL ルームを使って、改善したいと考える。貸し出しと返却を、AL ルームを使って行えば、使い方のわからない学生にその場で教えることもでき、先生方や教務課の手間を省け、さらには、充電のやりくりの問題も解決できるので、積極的に提案していく予定である。

### 3 今後の学生利用増加に向けての提案と試み

今年度は、小中学校でも利用されているような授業支援システム「ロイロノート・スクール」をあまり活用できていなかったが、7月にFD集会で2回目のロイロノート・スクールを使ったワークショップを行い、少しずつ、活用が増えている。

来年度は、より多くの授業で活用が見込まれるため、AL ルームで使い方の相談等受けることも増えることが期待される。授業支援システムは、小中学校でも同様のシステムが導入されている場合が多く、教員養成課程の学生にとってはシステムに慣れているだけでも、有用だと考えられる。来年度以降は、授業支援システムを使いこなす講習会なども検討する必要があると考えている。

### 4 おわりに

今後もアクティブ・ラーニング授業の推進・拡充を目的とし、愛知教育大学で教える先生方や将来教員となる学生が少しでもアクティブ・ラーニングについて考え、実践していくための手助けができるよう、AL ルームを改善し、いろいろな企画を実践していきたいと考えている。

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(文部科学省 教育の情報科の推進)

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# The Development of Teaching Skills Using ICT in Teacher Training: Practices in First-Year Introduction for ICT

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## ABSTRACT

In this study, improvements were made to the educational materials that aim to develop teaching skills using ICT of first-year students in teacher training, and such materials were implemented. Results showed that regarding teaching skills using ICT, items that reflected the students' own ability in information utilization primarily showed improvements. From this, it is surmised that this led to the learning of the basics of teaching skills using ICT that are needed for first-year students. On the other hand, changes in the assumed direction were not observed for awareness of the view of classes or AL. As a result of categorizing the self-analysis descriptions of students regarding their awareness of AL, negative effects were shown that led to the issue of this study, as well as positive effects from changes in the awareness of students.

## CCS Concepts

• **Social and professional topics**→**Professional topics**→**Computing education**→**Computing education programs**→**Information technology education.**

## Keywords

ICT in Education; Teacher ICT skills; Teacher education; Active Learning

## 1. INTRODUCTION

The computerization of education points to an aim to create an educational environment that adapts to the computerization of society and to increase the quality of education. One of the foundations that support the computerization of education is the enhancement of teaching skills using ICT. Currently, regarding the development of teaching skills using ICT among current teachers, scales to promote their growth are undertaken by the board of education of the state or regional governments.

There have been efforts that target the students of teacher training programs, but many of them are geared toward those who have

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completed practical teaching training or graduate students in their third or fourth year. As such, this study conducts the development and practice of training materials that aim for the growth of basic teaching skills using ICT among first-year teacher training students in the subject of information literacy.

Regarding the information literacy education at universities, Inoue [1] has pointed out that because the emphasis is on equipment operation, the “study of information literacy” and “opportunities to utilize it” are kept separate. As such, He [1] proposes a PBL-style class that determines specialized fields and encourages students to learn information literacy in the process of solving problems within their specialized field. This study treats the “computerization of education” as a specialized field that is an important topic for students aiming to become teachers. Additionally, it aims for the development of ability in information utilization and basic teaching skills using ICT, of which the former is necessary for university students who tackle various issues related to the computerization of education (the utilization of ICT in classes, information morals education, instructing children to acquire an ability in information utilization), and the latter is necessary for students who are aiming to become teachers or enter the educational profession.

Based on this background, we assume the use of information literacy in each basic subject, develop educational materials that incorporate perspectives of the computerization of education and active learning, and put them into practice [13]. This study reports the results of evaluating (1) the improvements to the educational materials after putting them into practice in the second year and (2) the impact of the practice from the perspectives of teaching skills using ICT, ability in information utilization), and the view of classes.

## 2. BACKGROUND

### 2.1 The Development of Teaching Skills Using ICT in Teacher Training

In the “Report on the Enhancement of the Capabilities of Teachers Who Play a Key Role in the Future of School Education” that was compiled in December 2015, in terms of teacher training as well, the issues of “effective classes that utilize ICT, the development of appropriate digital educational materials, and basic training for their use” were raised. Moreover, in the teacher training core curriculum that was later proposed, for the instruction method of each subject (including the use of information equipment and educational materials), the goal “to understand how to effectively use information equipment and educational materials in a way that adapts to the particular characteristics of the subject and to utilize them in designing the classes” was included as an attainment

target. Thus, the development of teaching skills using ICT in teacher training has become an important issue. Past efforts have been made regarding the development of teaching skills using ICT in teacher training and methods of instruction. Such efforts are divided into two categories: understanding the current state of students' teaching skills using ICT and the development and practice of instruction methods.

First, as an effort to understand the current state of teaching skills using ICT, Takeno et al. [12] researched the relationship between the checklist of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) that is used to study teachers' teaching skills using ICT and the utilization experience of teachers. As a result, it was found that the teaching skills using ICT of the students were low in the delivery of classes that had a deep relationship with the school, items that pertained to the evaluation of learning, and items that related to school affairs. Furthermore, it was also revealed that the experience and form of ICT utilization may affect teaching skills using ICT. In addition, Morishita [8] and Kanoe and Suzuki [3] compared the results of the students' checklist to the results of current teachers. As a result, it was shown that though there is not a significant gap between students' information morals and own utilization of ICT when compared to those of the teachers, there was a gap in its effective use toward the instruction of the school children and school affairs. Moreover, Yamane et al. [15] studied the correlation between the frequency of daily ICT utilization, experience in lectures and classes related to ICT utilization methods, and the sense of effectiveness felt toward ICT utilization. The result showed that even if daily ICT use is high, this does not necessarily lead to a sense of its effectiveness in the way one is instructing school children in ICT utilization.

From studies that have examined the current state of ICT utilization, it has been shown that though students' daily use of ICT affects their teaching skills using ICT, in terms of the school children's use of ICT or instructing them on their ability in information utilization, as well as ICT utilization in school affairs and other areas that are deeply related to school activities, there is a need for practical experience.

Next, as an effort to study the instruction methods of teaching skills using ICT, Kanoe and Nitta [2] implemented classes that aimed for second-year students to feel the need for ICT utilization in "Education Methods and Techniques" and heighten their motivation for its use. In the classes, the students viewed videos on how ICT is used in advanced schools or will be used in future schools, and afterward, discussed among themselves how ICT can be utilized in schools. Results showed that students felt that the computerization of society overall is progressing, and their motivation for ICT utilization increased. Moreover, Ogawa et al. [10] proposed a learning model through which students created educational videos that contained incorrect uses of ICT and encouraged the viewer to find what is a mistake and what is not, and the students viewed these videos. They [10] practically evaluated the effect of such a model, and results showed that for both the creation of such videos and their viewing, students acquired knowledge related to ICT utilization, and there was an increase in the checklist items. Furthermore, Kitazawa et al. [4] examined the impact of the students' direct experience with ICT on their understanding of, interest in, and motivation for teaching skills using ICT. They established a beginning and end period for the time through which direct experience was gained, then compared the effect in each period. Results showed that in either

period, the question items on the checklist that pertained to interest increased.

Many of the practical studies up until now have been conducted primarily in subject teaching methods or specialized educational fields. However, implementing only in certain subjects is insufficient for the development of teaching skills using ICT, and there is a need for these skills to be acquired in stages throughout all four years. For this reason, the authors developed a curriculum that develops students' ability in information utilization and teaching skills using ICT in the subject of information literacy that is taken in the first year [13]. Table 1 shows the relationship between the curriculum structure and the students' ability in information utilization, which is the aim of information literacy. By learning in their first year about the computerization of education and the use of ICT in classes, the aim was for the students to build a foundation for learning ICT utilization in later subjects.

**Table 1. Curriculum structure**

Chapter	Main Content	Main Ability in Information Utilization
1. Introduction	What is learned and how it is learned in classes/Preparation for collaborative learning	
2. Computerization of Education	3 aspects of the computerization of education	Proactive collection of necessary information, etc.
3. Information Education	The collection, organization, analysis, summarization, and expression of information	Report creation (Word Processing)
4. ICT Utilization in Classes	For what purpose ICT is being utilized	Presentation with awareness of the receiver
5. Computerization of School Affairs	Grades processing using security, email, and table calculation software	Mail/table calculation software
6. Information Morals Education	Necessary items in the instruction of information morals/mini class	Information morals
7. Conclusion	Action Plan for the Future	

## 2.2 Perspective of Proactive, Interactive, and Deep Learning

In the new educational guidance manual that was issued in 2017 and 2018, enhancements to the learning process were incorporated from the perspective of proactive, interactive, and deep learning (active learning). Active learning was originally emphasized in higher education, and in the study conducted by Benesse Educational Research and Development Institute (2016), between 2008 and 2016, opportunities for university students to receive AL-style classes increased.

On the other hand, for teacher training students, in addition to practicing active learning for themselves through AL-style classes, they must also study how they are learning so that when they become teachers, they can conduct such classes. As such, in



addition to incorporating AL-style classes into teacher training, there is also a need to support students so that they can study how they are learning and what the effects are.

With this in mind, in terms of the development of teaching skills using ICT, this study incorporated into the educational materials many learnings from AL-style classes as well as a support mechanism through which students can be made aware of the learning methods and their effects.

### 2.3 Development and Practice of ICT Utilization Workshops

Based on the above background, the authors have worked to increase the teaching skills using ICT of first-year teacher training students who take the information literacy class, as well as develop and practice educational materials for students to learn new learning methods through experience [11] [14].

By practicing the above up to the second year, improvements in teaching skills using ICT could be observed after the classes. However, on the other hand, the assumed effect was not observed through the incorporation of AL-style classes. It is believed that a reason for this was that even though AL-style classes were incorporated, the classes may still have been guided by the teacher.

### 2.4 Purpose

The results of previous research showed that teaching skills using ICT could be improved through the use of the developed educational material. However, the expected changes were not observed in the students' view of the classes. With this in mind, regarding the practices that were undertaken this year, it was decided to improve the educational materials and the evaluations before and after the classes so that the effects of the classes can be examined in greater detail.

## 3. METHOD

### 3.1 Educational Materials

Based on the results of what was practiced in 2017 [14], the 2017 educational materials were improved in the following ways. The workbooks distributed to the students and the class slides and group sheets used by the teachers were also prepared together.

- (1) Developing an evaluation rubric: In terms of reflecting on the learning content of each chapter, questions were asked that elicited explanations of what was learned, such as "explain the computerization of education in your own words, incorporating the 3 aspects." As a general rule, so that the learners themselves could evaluate, evaluation perspectives and evaluation standards were shown through a rubric (Table 2).
- (2) Deep active learning: Matsushita [5] raised "externalization with no internalization" as an issue of active learning. Internationalization means the acquiring of necessary knowledge, and externalization means the use of the acquired knowledge. Externalization without sufficient internalization results in an inability to fully use the knowledge, making it an empty attempt. Regarding this, Mori and Mizokami [7] have put forward a "cycle of internalization-externalization-internalization." By acquiring knowledge through internalization and using it through externalization, fluctuations and variations in the knowledge emerge. Through returning to internalization once again and processing these fluctuations, the belief is that this will result in deep learning (Figure 1). With this cycle in mind, the structure of the

educational materials was reevaluated. Moreover, an explanation of the learning cycle needed to realize deep learning was added in Chapter 1.

### 3.2 Classes

In the Introduction for ICT, which is a common subject taken by all students, the developed educational materials were used to implement a class for first-year students in a department at education university A. There were 928 students, divided into 19 classes. The class schedule is shown in Table 3.

Table 2. Example of the rubric

Criteria \ Level	A. Ideal	B. Standard	C. Needs improvement
Among the multiple information collection methods, was the method appropriate to the purpose selected?	Various search tools were tested, the appropriate method was selected, and information was collected.	Among multiple search tools, an appropriate method was selected, and information was collected.	Multiple search tools were not examined, a method was chosen with no basis, and information was collected.

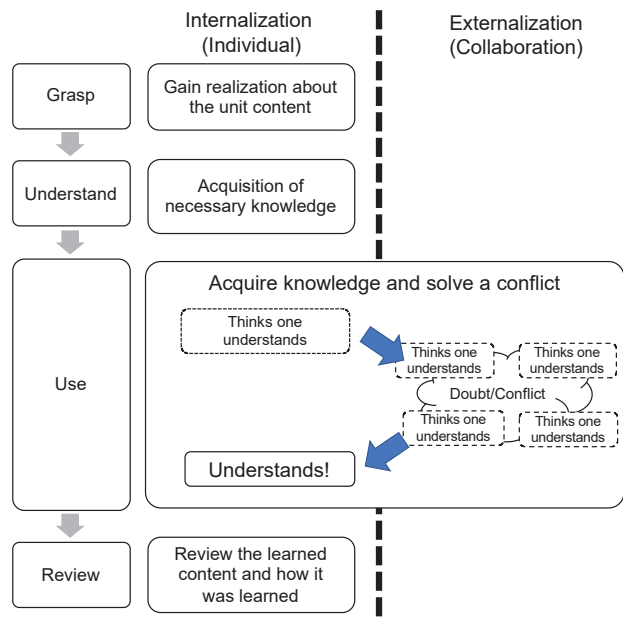


Figure 1. The flow of classes and the cycle of internalization-externalization-internalization

### 3.3 Evaluation of Classes

In order to evaluate the classes, before and after all classes, a survey was implemented to determine attitudes and behaviors pertaining to the checklist of teaching skills using ICT, the view of classes, and active learning.

#### 3.3.1 Teaching Skills Using ICT

Up until last year, the checklist of teachers' teaching skills using ICT (elementary school version) produced by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) (2007) was used. This checklist is built from 5 perspectives (A ability to utilize ICT for educational material research, preparation for instruction, evaluation, etc. B ability to utilize ICT for instruction during classes C ability to instruct school children in ICT utilization D ability to instruct about information morals, etc. E ability to utilize ICT in school affairs) and 18 items.

However, it has been pointed out that the current checklist needs reevaluation. New items have been added to propose a trial version in the research conducted in 2016 that aimed to improve the ICT utilization instruction survey items.

As such, in this year's practice, the checklist (trial version) was used to evaluate teaching skills using ICT. This checklist contains 4 aspects (A ability to utilize ICT in educational materials research, preparation for instruction, evaluation, school affairs B ability to utilize ICT for instruction during classes C ability to instruct school children in ICT utilization D ability to instruct about knowledge and attitudes that serve as the basis of information utilization) and 16 items. The basic structure of the checklist (trial version) is almost the same, but the differences are the following:

- The content of E was consolidated into A.
- Regarding B, in the current version, the question items focused on ICT utilization centering on the teacher, but items were added that focused on the utilization of ICT by the students as well as group utilization of ICT.
- In D, items were added pertaining to scientific understanding of information in the instruction of information morals.

By using the checklist (trial version), teachers' teaching skills using ICT can be evaluated in line with new learning instruction guidelines.

**Table 3. The structure of classes**

Class	Content
1	Guidance/network setting
2	Introduction (preparation for collaborative learning)
3	Computerization of education
4	Computerization of school affairs 2 Emails
5	Information education 1 (searching and collecting information)
6	Information education 2 (organizing and analyzing information)
7	Information education 3 (expressing information and creating documents)
8	ICT utilization in classes 1 Case study analysis
9	ICT utilization in classes 2 Case study presentation
10	Computerization of school affairs 1 Computerization of school affairs and security
11	Computerization of school affairs 3 Data processing through table calculation
12	Information morals education 1 Educational materials analysis
13	Information morals education 2 Mini classes
14	Conclusion
15	Summary Seminar
16	Test

### 3.3.2 View of Classes and The Quality of AL

The scales used last year were reevaluated, and the following scales were used for the evaluation.

#### (1) Scale of the view of classes

Nomura and Maruo [9] developed a scale of the view of classes that can examine the students' understanding of the classes they take. This scale consists of 14 items, of which 7 items are about the understanding of classes as a knowledge transfer, and the other 7 items are about classes as a cooperative activity. In order to confirm the changes in the view of classes that occurred through these classes, this scale was used. For each question, there were 6 levels of responses ranging from "not applicable at all" to "extremely applicable."

#### (2) AL scale

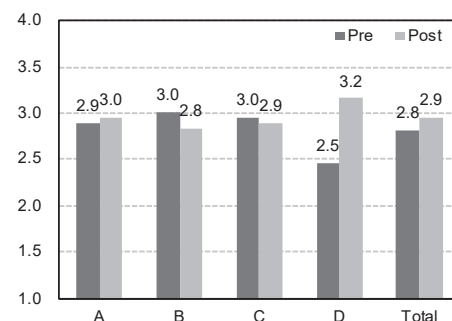
Mizokami et al. [6] developed a scale to evaluate the quality of active learning based on the cycle of internalization-externalization-internalization. This scale consists of 12 items, of which 3 items are about externalization, 5 items are about realizations through externalization, and 4 items are about the internalization after externalization. Factor analysis was conducted, and the general factor of the 12 items and the group factor of the 3 externalization items that contribute to the general factor were extracted. Prior to the study, students were asked about how much of the attitudes and behaviors indicated by the items they have shown in past active learning-style classes. After the study, the students were asked about how much of the attitudes and behaviors indicated by the items they have shown in these classes.

Regarding (2), for the students of the 4 classes that the first and second authors were in charge of, the pre- and post-study results were given to each student as feedback, and activities were conducted for students to analyze their own changes. The analysis data for this was also collected.

## 4. RESULT

### 4.1 Teaching Skills Using ICT

The pre- and post-study teaching skills using ICT results are shown in Figure 2. Regarding the average of each item and the overall average of all items, an analysis of variance was conducted with pre- and post-study as 1 factor. As a result, it was shown that the pre-study result for B was higher when compared to the post-study result ( $F(1,889)=32.96, p<.01$ ). Moreover, for D, the post-study value was higher than the pre-study value ( $F(1,889)=404.31, p<.01$ ). Furthermore, in terms of the average of all items, the post-study value was higher than the pre-study value ( $F(1,889)=17.97, p<.01$ ). From this, it was shown that teaching skills using ICT were improved through the classes. Additionally, in terms of each item, B the ability to utilize ICT for instruction during classes decreased after the study, and D the ability to instruct about knowledge and attitudes that serve as the basis of information utilization increased.



**Figure 1. Pre- and post-study teaching skills using ICT**

## 4.2 The View of Classes and Active Learning

The pre- and post-study views of classes are shown in Figure 3. Two-way analysis of variance was conducted with the view of classes (as a collaborative activity or knowledge transfer) and pre- and post-study results as within-subject factors. As a result, it was shown that there is significant interaction ( $F(1,646)=26.96, p<.01$ ). An analysis of simple main effect was conducted; results showed that the view of classes as a collaborative activity decreased from pre-study to post-study ( $F(1,646)=19.41, p<.01$ ). No changes were observed in the view of classes as knowledge transfer.

The results of the pre- and post-study AL scales are shown in Figure 4. Regarding the average of the 3 externalization factors and the average of the AL general factor 12 items, a one-way analysis of variance was conducted with each pre- and post-study result as within-subject factors. As a result, significant differences were not observed in AL externalization from pre- to post-study ( $F(1,836)=1.58, n.s.$ ). Regarding AL general, there was a significant decrease from pre- to post-study ( $F(1,836)=4.56, p<.05$ ).

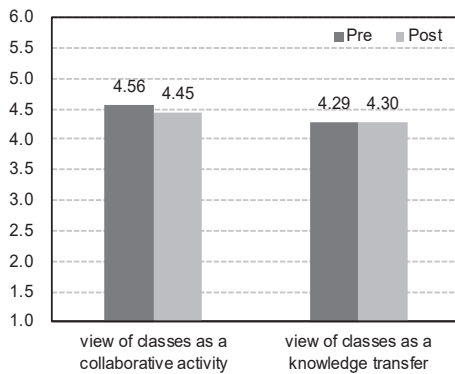


Figure 2. Pre- and post-study views of classes

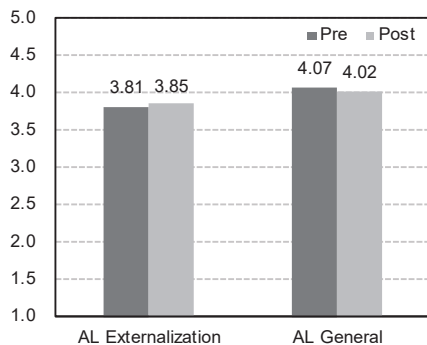


Figure 3. Pre- and post-study AL scale

## 5. DISCUSSION

We will discuss the results that have been analyzed. First, regarding teaching skills using ICT, the overall value and the value for D significantly increased from pre- to post-study. The item D is “ability to instruct about knowledge and attitudes that serve as the basis of information utilization,” and it includes abilities that we want students to develop in the information literacy classes. By developing teaching skills using ICT through the information literacy classes, this result suggests that the students’ ability in information utilization increased, and this let to

their evaluating a sense of effectiveness toward the instruction of knowledge and attitudes that serve as the basis.

On the other hand, there were no differences between pre- and post-study results for items A and C, and for item B, the results showed that the value decreased post-study. Regarding the reason behind the decrease in item B in particular, it is inferred that it is related to changes in the image students hold toward ICT utilization in classes. Pre-study, the students were unable to imagine in detail what instruction utilizing ICT looked like, resulting in high self-evaluations. However, through the classes, they realized that ICT utilization is not an alternative to the current tools being used, but instead, it is a potential for the creation of new values. Because they became more aware of the difficulties of doing this, it is surmised that post-study, they evaluated their own capabilities more harshly.

From these results, it again became clear that the development of teaching skills using ICT cannot be done in just one class, and thus, it must be developed through coordination with curriculum research and development subjects and specialized subjects. In the future, there is a need to practice this not just in one class, and consider the management of curriculums throughout all four years.

Table 2. Categorization of self-analysis of the reasons that the AL scales decreased

Deepening understanding of AL/question items	46.3%
Comparison with self (ideal/reality) (26.8%) <ul style="list-style-type: none"> <li>Because after undergoing various experiences in the classes, I realized that I lack learnings, and so my confidence decreased.</li> <li>With the exception of externalization, I felt difficulties in actually doing them.</li> </ul> Realizations about the evaluation (17.1%) <ul style="list-style-type: none"> <li>Because I became able to regard myself more strictly. Because as a result of deepening my understanding of information overall, I started to analyze using more detailed perspectives.</li> <li>My prior response was too lenient.</li> </ul>	
Lack of opposing opinions/spirited discussions in classes (collaborative learning)	26.8%
<ul style="list-style-type: none"> <li>Because there were no opposing opinions, and thus, during the classes, there were no instances in which I realized my mistakes or felt the biases that exist in the way I view things</li> <li>There were not many opinions that different from those of my classmates, so I was not stimulated</li> </ul>	
Stagnant self-growth	7.3%
<ul style="list-style-type: none"> <li>Overall, by seeing and listening to the presentation of my classmates, I realized what I lacked and deepened my understanding; however, I realized that if I were asked whether I was able to contribute something to my classmates, I cannot respond with confidence that I did</li> <li>Because when reflecting on the discussions held up until now, I felt that I could not clearly state what I learned</li> </ul>	

Next, we discuss the results of awareness of the view of classes and AL. Similar to the analysis results of prior research, in this study as well, awareness of the view of classes and AL proceeded in a direction opposite to what was assumed. In order to clarify why such a result occurred, the self-analysis results of the AL study were examined. Of the students of the 4 classes, the reasons stated by the 41 students whose AL scale decreased were categorized, shown in Table 4. When examining Table 4, it can be observed that nearly half of the students raised the reason that from before taking the classes to after taking the classes, there were changes in how they understood the AL scale and the question items. It can be surmised that for these students, as a result of their being able to more accurately evaluate their abilities needed for AL, the values decreased. This result can be interpreted as the students being able to positively change their awareness of AL.

On the other hand, more than 30% of the students raised the reason that they were unable to sufficiently achieve proactive, interactive, and deep learning during these classes. This result raises issues of the learning environment and topic-setting that can support such learning.

From these results, regarding the decrease in the AL scales, it was shown that there is a possibility that both positive and negative effects are mixed together. In terms of the view of classes, which showed similar results, the same possibility is assumed. As such, in the future, in addition to quantitative survey studies, descriptive data analysis must be conducted for all classes, and by conducting AL-style classes, it is necessary to analyze how students' awareness of classes and learning has changed.

## 6. CONCLUSION

In this study, improvements were made to the educational materials that aim to develop teaching skills using ICT of first-year students in teacher training, and such materials were implemented. Results showed that regarding teaching skills using ICT, items that reflected the students' own ability in information utilization primarily showed improvements. From this, it is surmised that this led to the learning of the basics of teaching skills using ICT that are needed for first-year students. On the other hand, changes in the assumed direction were not observed for awareness of the view of classes or AL. As a result of categorizing the self-analysis descriptions of students regarding their awareness of AL, negative effects were shown that lead to the issue of this study, as well as positive effects from changes in the awareness of students.

In the future, in addition to quantitative surveys, by using descriptive data analysis, through this study, we will examine in greater detail the effect of AL-style classes, in addition to the increase in teaching skills using ICT.

## 7. ACKNOWLEDGMENTS

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## THE DEVELOPMENT OF TEACHING SKILLS USING ICT IN TEACHER TRAINING: PRACTICES IN FIRST-YEAR INTRODUCTION FOR ICT

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## INTRODUCTION: ICT USE AT SCHOOL

- Using ICT at school is one of very important issues
- PISA2015 survey reported that using ICT at school in Japan is delayed.

Percentage of students who use school computers for group work and communication with other students at school at least once or twice a week.

Country	Percentage (%)
Armenia	~85
Australia	~80
Austria	~75
Bahrain	~70
Belgium	~65
Canada	~60
Chile	~55
Colombia	~50
Czechia	~45
Denmark	~40
Egypt	~35
France	~30
Germany	~25
Greece	~20
India	~15
Indonesia	~10
Iran	~5
Italy	~4
Japan	3.7
Latvia	~3
Lithuania	~2
Malaysia	~1
Mexico	~1
Netherlands	~1
Norway	~1
Poland	~1
Portugal	~1
Russia	~1
Saudi Arabia	~1
Slovenia	~1
Spain	~1
Sweden	~1
Switzerland	~1
Taiwan	~1
Thailand	~1
Turkey	~1
United Kingdom	~1
United States	~1
Uruguay	~1
Vietnam	~1

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## INTRODUCTION: ICT USE AT SCHOOL

- Using ICT at school is one of very important issues
  - PISA2015 survey reported that using ICT at school in Japan is delayed.
- In order to improve these issues, it is necessary to advance the following efforts.
  - The development of teaching skills using ICT among current teachers
  - The development of teaching skills using ICT for the students of teacher training programs

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## BACKGROUND: THE DEVELOPMENT OF TEACHING SKILLS USING ICT IN TEACHER TRAINING

- Past efforts regarding the development of teaching skills using ICT in teacher training are divided into following two categories.
- Efforts to understand the current state of students' teaching skills using ICT
  - Students' daily use of ICT affects their teaching skills using ICT. However, skills that are deeply related to school activities, such as the school children's use of ICT or instructing them on their ability, there is a need for practical experience. (Morihisa, 2014; Kanoe, 2016; Yamane et al., 2017)
- Efforts to study the instruction methods of students' teaching skills using ICT
  - Many of the practical studies up until now have been conducted primarily in subject teaching methods or specialized educational fields (Ogawa et. al., 2017; Kitazawa et. al., 2018).

We developed a curriculum that develops students' teaching skills using ICT in the subject of information literacy that is taken in the first year.

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## BACKGROUND: HOW TO ACTIVE LEARNING

- Additionally, the perspective of proactive, interactive, and deep learning (active learning) also important for learning according to the revision of the Japanese curriculum guidelines.
- For teacher training students, in addition to practicing active learning themselves, they must also be able to conduct such class when they become teachers.
- As such, we include AL-style learning activities and knowledge about AL into educational materials.

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## BACKGROUND: OUR PREVIOUS STUDY

- We have developed a curriculum that develops their teaching skills using ICT. (Umeda et al., 2016)
- This curriculum encourages them to refine their ability of "information literacy" acquired by high school in the process of solving problems within topics on "the teaching skills using ICT".

The relationship between ability of information literacy and teaching skills using ICT

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### BACKGROUND: OUR PREVIOUS STUDY

- We have practiced to increase the teaching skills using ICT of first-year teacher training students who take the information literacy class (Saito et al., 2016; Umeda et al., 2018).
- By practicing the above up to the second year, improvements in teaching skills using ICT could be observed after the classes.
- However, the assumed effect was not observed through the incorporation of AL-style classes.

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### PURPOSE

- This study aim for the growth of basic teaching skills using ICT among first-year teacher training students in the course of information literacy.
- In this presentation, we reported the following points:
  - (1) The improvements to the educational materials based on the results of practice in the second year
  - (2) The evaluations of the practice from the perspectives of teaching skills using ICT and the quality of AL

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### METHODS: EDUCATIONAL MATERIALS

- Based on the results of what was practiced in 2017(Umeda et al., 2018), the educational materials were improved in the following ways.
  - (1) Developing an evaluation rubric
  - (2) Deep active learning

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### METHODS: EDUCATIONAL MATERIALS

- Based on the results of what was practiced in 2017(Umeda et al., 2018), the educational materials were improved in the following ways.
  - (1) Developing an evaluation rubric
    - To reflect on the learning content of each chapter, questions were asked that elicited explanations of what was learned.
    - So that the learners themselves could evaluate, evaluation perspectives and evaluation standards were shown through a rubric.

Example of the rubric

Criteria	Level	A. Ideal	B. Standard	C. Needs improvement
Among the multiple information collection methods, was the method appropriate to the purpose selected?		Various search tools were tested, the appropriate method was selected, and information was collected.	Among multiple search tools, an appropriate method was selected, and information was collected.	Multiple search tools were not examined, a method was chosen with no basis, and information was collected.

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### METHODS: EDUCATIONAL MATERIALS

- Based on the results of what was practiced in 2017(Umeda et al., 2018), the educational materials were improved in the following ways.
  - (2) Deep active learning
    - Matsushita (2015) raised "externalization with no internalization" as an issue of active learning.
    - Mori and Mizokami (2017) have put forward a "cycle of internalization-externalization-internalization."

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### METHODS: EDUCATIONAL MATERIALS

Cycle of internalization-externalization-internalization

- Based on the results of what was practiced in 2017(Umeda et al., 2018), the educational materials were improved in the following ways.
  - (2) Deep active learning
    - Matsushita (2015) raised "externalization with no internalization" as an issue of active learning.
    - Mori and Mizokami (2017) have put forward a "cycle of internalization-externalization-internalization."

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### METHODS: CLASSES AND STUDENTS

- We used the improved educational materials in introductory course of information literacy in A university of education.
- There were 928 students in 19 classes.
- These classes were practiced from April to August at 2018.

Class	Content
1	Guidance/network setting
2	Introduction (preparation for collaborative learning)
3	Computerization of education
4	Computerization of school affairs 2 Emails
5	Information education 1 (searching and collecting information)
6	Information education 2 (organizing and analyzing information)
7	Information education 3 (expressing information and creating documents)
8	ICT utilization in classes 1 Case study analysis
9	ICT utilization in classes 2 Case study presentation
10	Computerization of school affairs 1 Computerization of school affairs and security
11	Computerization of school affairs 3 Data processing through table calculation
12	Information morals education 1 Educational materials analysis
13	Information morals education 2 Mini classes
14	Conclusion
15	Summary Seminar
16	Test

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### METHODS: EVALUATION OF EDUCATIONAL EFFECTS

- In order to evaluate the classes, before and after all classes, following questionnaires were conducted.
  - Teaching Skills Using ICT
  - The Quality of AL

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### RESULTS: TEACHING SKILLS USING ICT

- In order to evaluate the classes, before and after all classes, following questionnaires were conducted.
  - Teaching Skills Using ICT
    - To evaluate students' teaching skills using ICT, we used checklists produced by the MEXT.
      - This checklist contains following 4 aspects
        - A: ability to use ICT in preparation for educational materials, instruction, evaluation, school affairs
        - B: ability to use ICT for instruction during classes
        - C: ability to instruct school children in ICT using
        - D: ability to instruct about knowledges and attitudes that serve as the basis of information literacy
  - The Quality of AL

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### RESULTS: TEACHING SKILLS USING ICT

- The average of all item in Teaching skills using ICT were improved through the classes ( $p < .01$ ).
- The average of 4 aspects:
  - The ability to utilize ICT for instruction during classes (B) decreased ( $p < .01$ ).
  - The ability to instruct about knowledge and attitudes that serve as the basis of information literacy (D) increased ( $p < .01$ ).

Aspect	Pre	Post
A	2.9	3.0
B	3.0	2.8
C	3.0	2.9
D	2.5	3.2
Total	2.8	2.9

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### RESULTS: THE QUALITY OF AL

- In order to evaluate the classes, before and after all classes, following questionnaires were conducted.
  - Teaching Skills Using ICT
  - The Quality of AL
    - Mizokami et al. (2016) developed a scale to evaluate the quality of active learning based on the cycle of internalization-externalization-internalization.
      - This scale consists of 12 items.
        - 3 items are about externalization
        - 5 items are about realizations through externalization
        - 4 items are about the internalization after externalization

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### RESULTS: THE QUALITY OF AL

- Significant differences were not observed in AL externalization.
- There was a significant decrease in AL general ( $p < .05$ ).

Category	Pre	Post
AL Externalization	3.81	3.85
AL General	4.07	4.02

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### DISCUSSION: TEACHING SKILLS USING ICT

- Teaching Skills Using ICT
  - The average of aspect D significantly increased from pre to post class.
  - D is the ability to instruct about knowledge and attitudes that serve as the basis of information literacy

The students' ability on information literacy increased through the class, and this led to their evaluating a sense of effectiveness toward the instruction of those knowledge and attitudes.

- The average of aspect B significantly decreased from pre to post class.
- B is the ability to use ICT for instruction during classes

The development of teaching skills using ICT cannot be done in just one class. There is a need to consider the management of curriculums throughout all four years.

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### DISCUSSION: THE QUALITY OF AL

- The Quality of AL
  - As well as previous research, the quality of al showed a different result than expected.
  - To clarify why such a result occurred, the self-analysis results of the Quality of AL were examined.
  - We collect the students' self-analysis from 4 classes.
  - The self-analysis of 41 students whose AL scale decreased in post class were categorized.

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### DISCUSSION

Nearly half of students raised the reason that their understanding about AL scale and the question items changed from before to after class.

This result can be interpreted as the students being able to positively change their awareness of AL.

More than 30% of the students raised the reason that they were unable to sufficiently achieve active learning during these classes.

This result clear issues of the learning environment and topic-setting that can support such learning.

Category	Percentage
Deepening understanding of AL/question items	46.3%
Comparison with self (ideal/reality) (26.8%)	26.8%
Lack of opposing opinions/spirited discussions in classes (collaborative learning)	26.8%
Stagnant self-growth	7.3%

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### CONCLUSION

- We developed a curriculum that develops students' teaching skills using ICT in the subject of information literacy that is taken in the first year.
  - The improvements to the educational materials after putting them into practice in the second year and practiced in the third year.
  - The evaluations of the practice in the third year from the perspectives of teaching skills using ICT, the view of classes, and the quality of AL.
- The results showed that students acquire the basics of teaching skills using ICT.
- However, regarding the quality of AL, negative effects were shown that lead to the issue of this study, as well as positive effects from changes in the awareness of students.
- In the future work, we improve and evaluate our practice based on these results.

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